# THE IRON ORES

OF THE

# UNITED STATES.

EXPLANATION OF COLORS.
Magnetites
Hematites (including specular ores)
Fossil or Dyestone ores
Limonites
Carbonates (principally of the Coal Measures)
Bog ores
The ground tints indicate the areas of the ore fields; the dots indicate in a general way the position of the mines, or groups of mines, worked or sampled in the census year.
GEOGRAPHICAL DISTRIBUTION
OF THE
IRON ORES
OF THE
UNITED STATES.
Julius Bien
Scale
100 0 100 200 300 400 500 600 Miles.

# GEOGRAPHICAL AND GEOLOGICAL DISTRIBUTION OF THE IRON ORES OF THE UNITED STATES.

By Raphael Pumpelly.

The great coal-field of the central United States is surrounded on the north, east, and south by the uplifted older rocks of the Wisconsin—Michigan, the Appalachian, and the Ozark regions.

This basin and its border contain the fuel and the ore on which and with which the material prosperity of the United States of the twentieth century must be built. It becomes, therefore, of importance to obtain a general survey of the distribution of the various kinds of iron ore both geographically and in the geological column.

On the extreme edge of the border that incloses the coal basin we find in the north and east the Archæan with its immense development of magnetic and specular ores. Next within this and overlying it is the Canadian-Cambrian series, the substructure of the first great longitudinal valley of the Appalachians extending from Canada to Alabama. This valley is not less remarkable for its enormous wealth in limonite ores than for the fertility and durability of its soil. Still farther inward the shales of the Clinton age mark a belt of hematite ore extending from central Alabama to and through eastern New York, and thence westward across the state. The belt thus outlined will be seen, on the map, to have a breadth of from 50 to over 100 miles. Within it, but less persistent in longitudinal representation, are deposits of iron ores occurring—some here some there—in strata of almost every age from the Archæan to the Coal-measures, and the great coal-field thus iron-bound is itself rich in carbonate ores, generally occurring either as clay iron stone, or as black band, or in places as a ferriferous limestone altered to limonite. The map does not attempt to represent the actual distribution of the ores of the Coal-measures, but only the areas within which they were sampled for this investigation.

On the south the Archæan rocks come to the surface only in eastern Missouri, and they here exhibit a great development of magnetic and specular ores. But they occupy only a small area in the broad iron-bearing belt on the map that stretches with a breadth of 100 miles or more northwesterly from Alabama to western Missouri. With the exception of the Missouri Archæan ores this belt consists wholly of later ores, viz, specular and limonite ores of the Cambrian in Missouri, and limonites on the Subcarboniferous limestones of Missouri, Tennessee, and Kentucky.

On the north, far removed from the coal-field, are the extensive and numerous deposits of rich specular and magnetic ores of the Huronian in northern Minnesota and northern Michigan. Farther eastward the northern border is represented beyond our field of investigation by ores of different kinds, but especially Archæan in that part of the territory of the Dominion of Canada lying north of the great lakes.

Iron in various mineral conditions, and especially as an oxide, is among the most widely disseminated of the elements. It is a base with a strong affinity for the acids most frequent in the waters circulating in the upper crust of the earth, viz, carbonic, sulphuric, and the organic, acids. It also has a stronger affinity for oxygen, and in the presence of this it forms the nearly indestructible and—in the ordinary processes of nature—in the absence of organic matter, almost insoluble sesquioxide. As a sesquioxide, in the presence of organic matter, it provides the oxygen for decay, and its residuary protoxide is itself dissolved by the resulting organic acid, and enters into circulation. If the laboratory is a marsh or pond, the iron protosalt is reoxidized at the surface of the water and returns to the bottom as the higher oxide to again part with part of its oxygen and again to be dissolved as a protosalt, and this is continued until the organic matter is consumed; then the iron accumulates on the bottom as a hydrated oxide, or limonite, or "bog-ore".

Rock strata containing organic matter and diffused iron oxide have lived through similar processes, except that the iron, after furnishing its oxygen to the decaying matter and forming a soluble protosalt with the resulting organic acid, has entered into more extended circulation.

The most common solvents of iron in nature are carbonic acid and sulphuric acid; the latter becomes an important agent in moving and concentrating iron, under certain circumstances, as in solfataric action and in the

oxidation of pyritiferous rocks like the Devonian shales of Pennsylvania and Virginia. But doubtless carbonic acid is the most general agent. Besides arising from the oxidation of organic matter confined in sedimentary strata, it enters the earth as an accessory of rain-water, and more is taken up by the water from the decaying vegetable mold; it is also liberated in depth from limestone by the action of chemical processes and enters the ascending currents. However formed, it becomes an accessory constituent of the water that permeates the rocks, and, alone or in connection with other agents, it decomposes the silicates and carries off the iron as a bicarbonate. It follows the channels of flow until it reaches an arresting cause. One such arresting cause, of ultimately great economic importance, is the carbonate of lime in limestones and dolomites and calcareous sandstones resulting in the replacement of lime by iron; another, of equal importance, is oxygen, whether at the surface, where the soluble iron protosalt emerging in spring-water is oxidized to a limonite, or in caverns or small cavities, where it is oxidized and, parting with its acid, is deposited in successive thin films to form stalactitic and mammillary masses of hydrated sesquioxide; therefore, when we consider the general diffusion of iron in both detrital and crystalline rocks, in all sediments and all eruptions, and its remarkable reciprocating relation in the most common and essential processes of nature, it is not strange that we should find it represented by local accumulations in the rocks of every geological age.

How unequal, from an economic point of view, the geological and geographical distribution of concentrated deposits is, will appear from the following review, and from the columnar chart, and from the statistical tables accompanying this chapter:

The survey of the ore-producing field of the United States gives us a pretty good knowledge of the areas within which future discoveries are to be expected. The great wave of activity in the industry in 1880 and 1881 caused a very energetic exploration throughout the old fields and into new ones. This resulted in very few discoveries in the already producing districts. It was made clear that to find new deposits exploration has to go into new fields On Lake Superior the Gogebic district in Michigan, and the Vermillion district in Minnesota, already known to contain iron, were actively explored, and railroads are now built into them. The same cause led to the development of new fields in the southeastern states.

But the growth of the iron industry, notwithstanding its fluctuations as a whole, is making an enormous drain upon the productive deposits of ores of certain classes, such as ores of higher grades in iron percentage, Bessemer ores, etc.

The producing capacity of mines is enlarged to meet the demand and to diminish the cost per ton; small deposits become exhausted; the end of medium-sized ones becomes evident, and with the really great ones, which are also really few in number, it is only a question of years. To satisfy the demands, growing larger every decade for these ores, new fields will need to be found. In a general way we can outline these for the eastern half of the United States Extensive stretches of the Archæan highlands, especially in Pennsylvania and North Carolina, promise discoveries if subjected to careful magnetic surveys, and the same may be said of the Adirondacks. The Archæan areas north and south of Lake Superior are unquestionably the great fields of future discovery. In the Michigan-Wisconsin areas the ore-bearing horizons of the Huronian are known to extend hundreds of miles through the little-explored wilderness as "iron ranges" waiting for the discovery of the richer ore-bodies. This is notably the case in the region through which the lower members of the Huronian extend to connect the Marquette and Menomonee regions. In regard to the ores of Canadian age, doubtless new limonite discoveries will be made in the "valley" in Pennsylvania toward compensating the exhaustion of known bodies. But the future field for ores of this age, especially specular, is in the Ozark region of Missouri and Arkansas. With the fossil ores it is only a question of a few years before the hematites will be exhausted. The world's consumption of iron and steel must increase largely, and the practical exhaustion of accessible rich ores will perhaps be compassed within the life of the present generation. We shall have then to fall back upon the leaner ores, that is, largely upon the siliceous-specular and siliceous-magnetic ores, ranging between 30 per cent. and 45 per cent. in iron. Of these there are vast quantities, though generally remote from metallurgical coal, and especially in the Huronian of the Lake Superior iron regions. At present in the east the magnetites smelted probably do not average above 50 per cent. in iron, while in Michigan and Missouri they average not less than 60 per cent.

That lower grades of these hard ores find their way to market is shown by the fact that in the census year there were mined in Pennsylvania, New Jersey, and New York, 336,767 tons of magnetite, more or less siliceous, carrying below 45 per cent. iron. There were also mined, chiefly in Pennsylvania, 697,283 tons of limonite, mostly aluminous, carrying less than 40 per cent. iron.

Geologically speaking, the lowest iron ores are included in the Archæan rocks, and of such occurrences we have a number of fields. The great highland range of mountains that now forms the eastern bulwark of our continent, as it probably once formed the western maritime range of a Palæozoic Atlantis, is stored with bodies of magnetite from New England to Georgia. Between lakes Ontario and Champlain lies an important Archæan region, with a variety of magnetic ores.

On the northwestern and southern shores of Lake Superior the upper member of the Archæan contains numerous and immense deposits of both specular and magnetic ores.

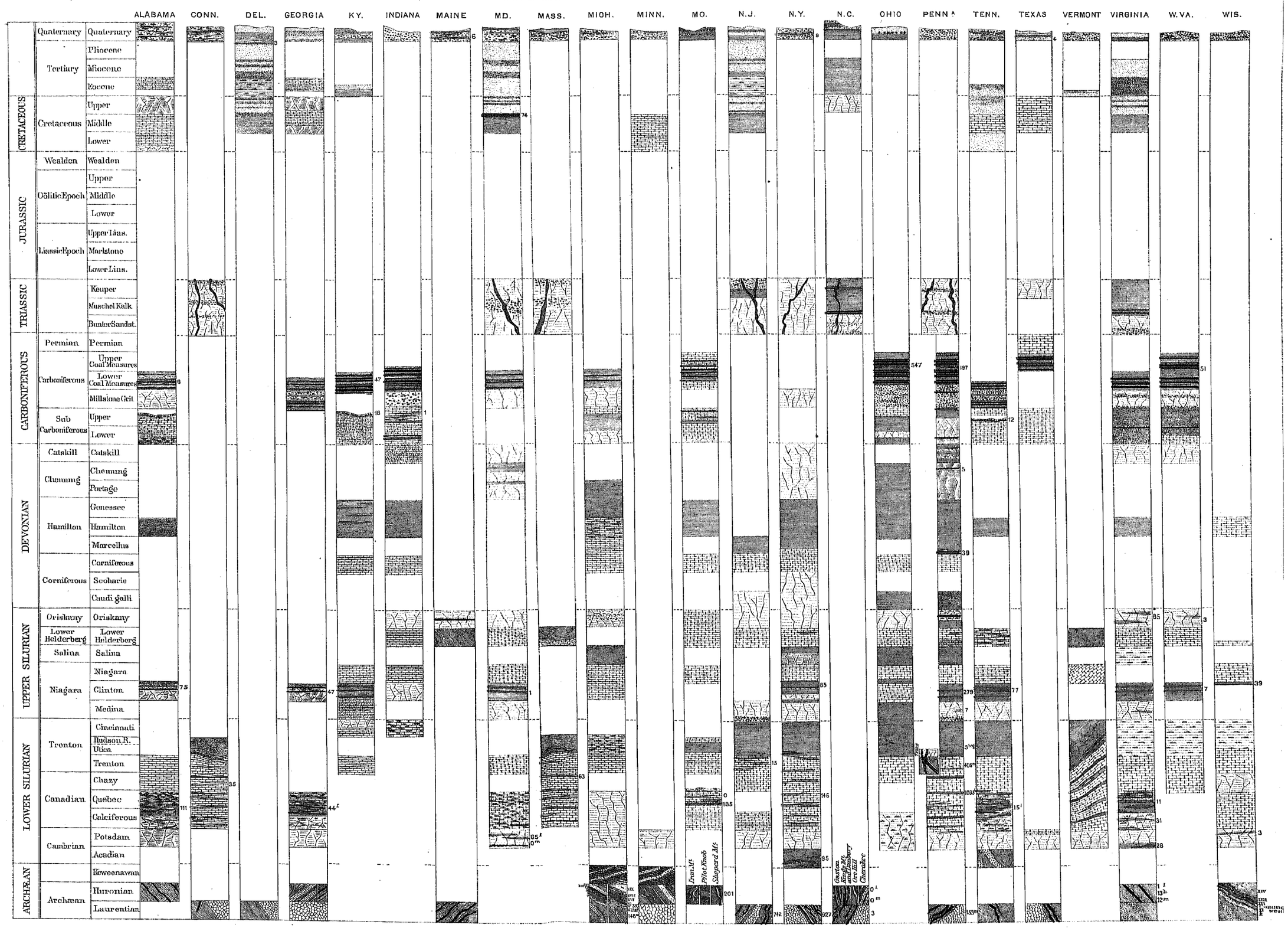
# GEOLOGICAL DISTRIBUTION OF THE IRON ORES OF THE UNITED STATES.

Compiled chiefly from the State Geological Surveys.

*The Figures on the right of the columns indicate the number of thousands of tons of ore mined from the horizons near which they are placed in the Census year. Where several kinds of ore were produced from one horizon, the tonnage of each kind is indicated by the use of exponential letters as follows: i. denotes limonite, m. magnetite, h. hematite and c. carbonate.*

| Rocks | |
|---|---|
| Limestone | |
| Sandstone | |
| Shale Clay beds | |
| Argillaceous Limestone | |
| Arenaceous Limestone | |
| Argillaceous Sandstone | |
| Calcareous Sandstone | |
| Arenaceous Shale | |
| Calcareous Shale | |
| Conglomerate and Glacial drift | |
| Sand | |
| Granite | |
| Gneiss Metamorphic Schists | |
| Eruptive Rocks Veins | |
| Eruptive Rocks Flows | |

- Magnetite
- Hematite
- Limonite
- Carbonates and derivatives




Julius Bien & Co. Lith.

The fourth Archæan region east of the Rocky mountains, that of Missouri, is very limited in comparison with the two already mentioned, but it also contains several great ore-bodies. Farther west, ore-deposits of various kinds are known at several points in the Archæan of the Cordilleras. Each of the eastern Archæan fields is

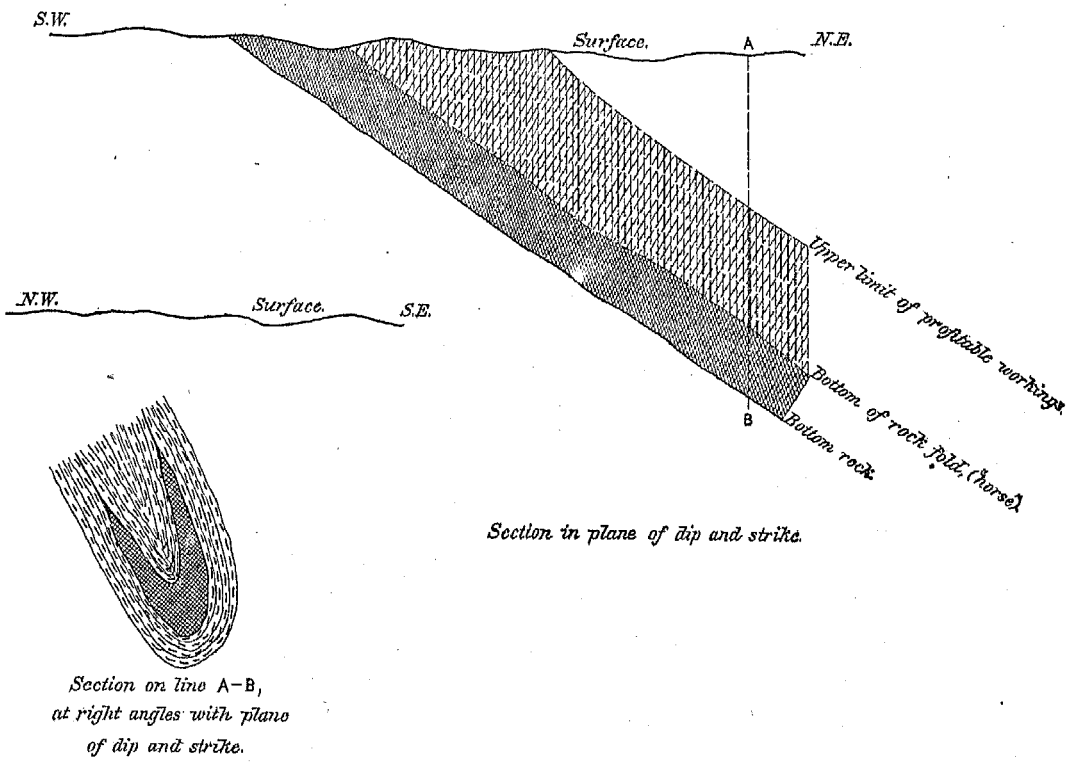



FIG. 1.—SKETCHES TO ILLUSTRATE A COMPRESSED PITCHING SYNCLINAL OF MAGNETIC ORE.

stamped with a marked individuality, not only in its structure and lithological constitution, but also in the habit of its ore occurrences. The eastern Highland range consists of Laurentian gneisses, syenitic and granitic rocks and limestones, and its ores are almost exclusively magnetites. The Adirondack-Champlain region consists of Laurentian gneisses, differently arranged structurally from the Highland range. The Lake Superior ores are specular and magnetic ores bedded in the schists of the Huronian; and the Missouri-Archæan ores are both specular and magnetic, and the alteration product of the latter—martite, and they occur exclusively associated with porphyries and clastic porphyry rocks, supposed to be of Huronian age. And parallel with these differences go fundamental differences in the forms of deposits and character of ores. In the Highland range the rocks are stratiform and tilted, striking northeast and southwest, and dipping steeply to the southeast. They form a belt from 10 to 20 miles wide. They consist in New Jersey and New York chiefly of hornblendic gneiss or syenite granite, and crystalline limestone. According to Mr. Smock, of the geological survey of New Jersey, and a special agent in the statistical part of our census work, these gneisses are rarely free from magnetite, and are often sufficiently impregnated with it to form immense beds of lean ore, and in places workable deposits.

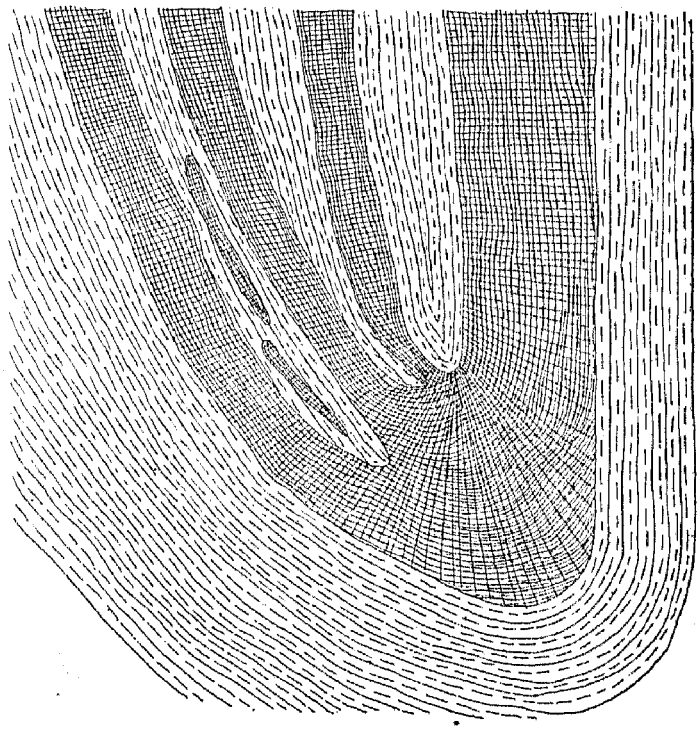


FIG. 2.—SECTION AT THE HURD MINE, MORRIS COUNTY, NEW JERSEY. From *Geology of New Jersey*, 1868.

Magnetite ore-bodies also occur occasionally in the crystalline limestone.

As stated in Mr. Putnam's report, in many of the mines there is no sharp plane of demarkation between the ore and the wall rock, the ore and the gneiss both carrying the same minerals in inverse proportions. In going from the center of an ore-body outward the gneiss minerals increase as the ore diminishes, the limit of the ore-body

being that at which the ore becomes unprofitably lean. In other mines the demarkation is sharply indicated by a smooth wall. A marked peculiarity of the ore-bodies of this highland range is in their structural forms. As will be seen by referring to Mr. Putnam's report, or to the publications of the Geological Survey of New Jersey, there are two well-defined forms: (1) The narrow synclinal, in which the relatively narrow and thin ore-body occupies the bottom of a synclinal fold (Figs. 1 and 2). (2) The *"pinch and shoot"*. *In this the single "shoot" is a pod*-shaped body, thick along its longitudinal axis, but growing rapidly thinner toward its edges. Several of these are often close together in the same plane of stratification and connected by a thin stratum of ore, a "pinch". (Fig. 3).

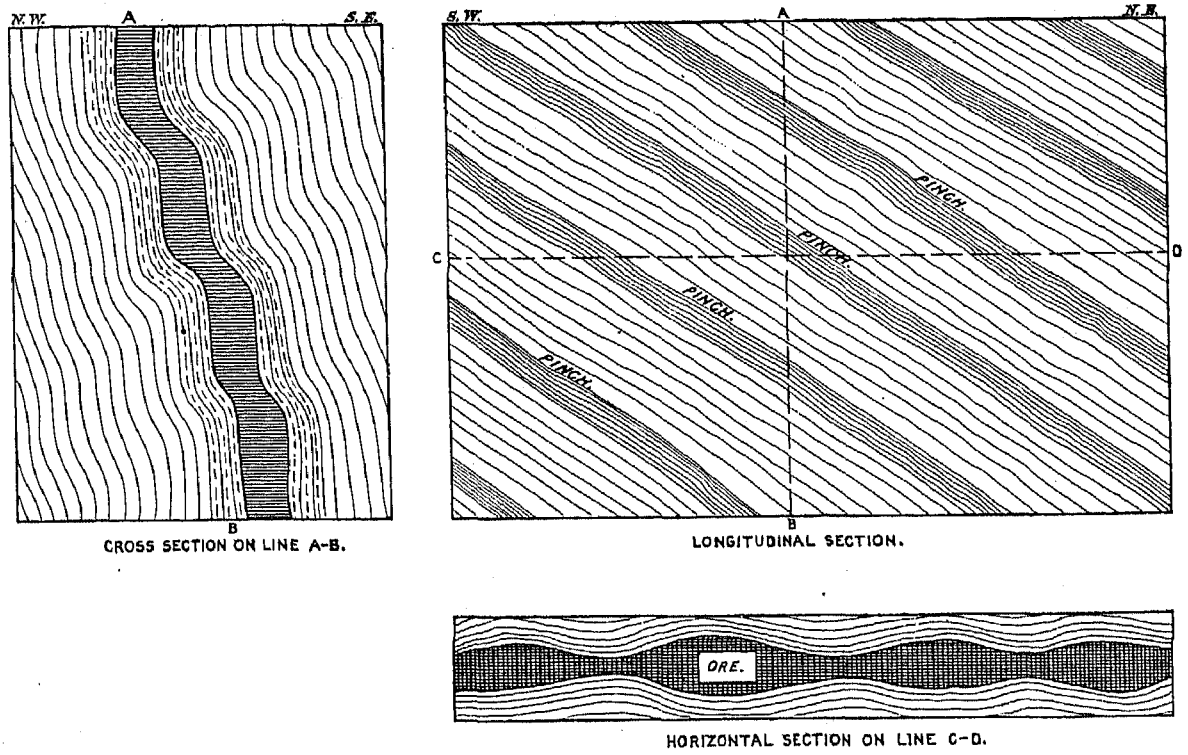



FIG. 3.—SKETCHES TO ILLUSTRATE THE "PINCH AND SHOOT" STRUCTURE OF SOME OF THE NEW JERSEY MAGNETIC ORE DEPOSITS.

NOTE.—The vein of ore is generally relatively much thinner at the pinches than is indicated in the "cross-section on line A–B". The ore is sometimes entirely "cut out" by the walls coming together.

In both of these the ore-body is of great and unknown length compared with its breadth, which is rarely over 100 feet, and its thickness, which is seldom more than 80 feet, and more commonly less than 30; in both the axial plane of the body is in the plane of stratification, and in both the longest axis is inclined, generally to the northeast. This inclination is called "pitch". The ore forms thus either a long, trough-shaped body, or a pod-shaped body, as the case may be, *lying conformable to the bedding, but pitching in a direction between the strike and the dip of* the gneiss. The ores are associated with quartz, hornblende, feldspar, and apatite. They range from 28 per cent. to 66 per cent. in iron and in phosphorus ratio from 0 to 3.65. But as a matter of fact the Bessemer ore mined in New Jersey contained less than 45 per cent. of iron and was produced by only a few mines.

This Archæan range passing out of New Jersey carries its ore-bearing habit with it into Pennsylvania, where it is known as the South mountain. It has not been as extensively explored for iron ore as in New Jersey and New York, but the ores occur in a similar manner, although they have a remarkably lower phosphorus ratio, bringing many of them within the Bessemer limit. This may be due to the fact that, unlike most of the New Jersey mines, these are south of the region of glaciation, and the opened portions of the deposits may be still within the zone that has been exposed to the action of solvents during geological ages, an action which generally diminishes largely the phosphorus ratio. As we go farther south along the Archæan range we find that the ore-bodies of this age have generally not been worked sufficiently to show fully their extent and frequency, nor their forms.

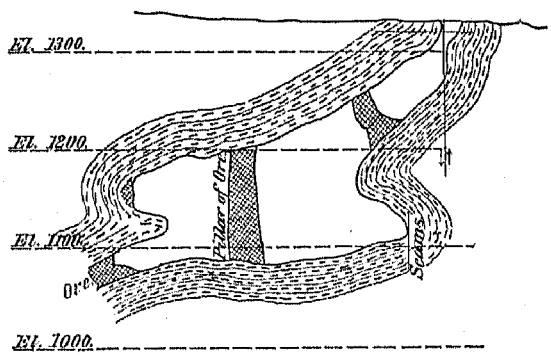
In Virginia the Archæan ores have been mined to some extent on the James river below Lynchburg, and farther to the southwest. The beds containing these ores are considered by Rogers to be probably of Huronian age. The ores are magnetite more or less altered to martite, and specular ore. The foot-wall is talcose or hydro mica-schist, and the hanging-wall a quartzite; and as a rule the specular lies next the schist, and the magnetic next or in the quartzite. This series of relations corresponds perfectly in kind and in order of succession with that of the rocks, fresh ores, and martite of the Marquette district of Lake Superior. The ore-lenses vary from 1 to 15 feet in thickness. In iron they range as mined from about 36 per cent. to 60 per cent., and they are very variable in phosphorus, of which the ratios range from 0.034 to 0.472. Hydrated ores in close proximity to these and contained in the schists have a high phosphorus ratio.

Passing into North Carolina, we find the range of Kerr's Lower Laurentian of western central North Carolina containing titaniferous magnetites in lenticular bodies. The Tuscarora and the Dannemora are the representatives of this class; they have very low phosphorus ratios, but carry considerable titanic acid. In the high range, near the Tennessee border, the gneisses of the Upper Laurentian carry deposits of magnetite, of which the Cranberry and Big Rock Creek mines are examples. Like the New Jersey deposits, these ores are mixed with silicates, pyroxene (instead of hornblende), epidote, etc. The phosphorus ratios of these ores are very low, 0.006 to 0.037. Certain mica-schists, near Danbury, sufficiently impregnated with magnetite to be profitably mined, and becoming charged with pyrites below water-level, are assigned by Kerr to the Upper Laurentian. Our samples gave a phosphorus ratio above the Bessemer limit, but the analyses of the washed ore show that washing lowers the phosphorus ratio to well within that limit. Magnetite occurs in lenticular masses and in workable impregnated beds in the group of schists—mica, chlorite, talcose, and itacolumnite—of western North Carolina, which are assigned by Kerr to the Huronian. They have a very low phosphorus ratio—0.002 to 0.075. Stratified specular ore occurs in the Huronian schists of central North Carolina. At Buckhorn it was worked with a local thickness of 36 feet, associated with manganese and garnet rock. These ores were found to be low in iron, and to contain some titanium, but they have a low phosphorus ratio, 0.043 to 0.070.

One of the most important among the ore-bearing Archæan fields is that of northern New York. It belongs, structurally, to the great Canadian nucleal area, and is separated from the Appalachian Laurentian formation by the Paleozoic rocks of eastern New York. It is pre-eminently a region of Laurentian gneisses, and in these occur some of the most extensive as well as most complicated ore-bodies on the continent. The forms of the ore-bodies are interstratified, irregular lenses, in places forming several parallel beds, and lying in simple monoclinals; at others, squeezed into the pinch and shoot form, so common in New Jersey, or, again, enormously thickened in the enlarged bends of corrugated folds, as at Mineville. Many of the ore-bodies are, like those of New Jersey, largely mixed with the minerals of the adjoining rocks, quartz, feldspar, hornblende, and in places an excess of apatite.

They are easily classified into (1) ores high in phosphorus and low in sulphur; (2) ores low in both phosphorus and sulphur; (3) pyritiferous ore usually low in phosphorus; (4) titaniferous ore.

According to Mr. C. E. Hall, the non-titaniferous iron ores belong in the Lower Laurentian, and these divide again into an upper horizon with ores low in phosphorus, and a lower highly phosphatic horizon of ore. The titaniferous ores he assigns to the Upper Laurentian. Where ore-bodies rich in phosphorus occur near others much freer from this impurity, the latter are seen to occupy a higher horizon, as in the Mineville group, where the New Bed, Barton Hill, and Fisher Hill mines, belonging higher in the gneisses, are low in iron, 39 to 50 per cent., and contain abundantly intermixed quartz, but have a very low phosphorus ratio, 0.005 to 0.096. These ores are frequently enriched by separation to over 60 per cent. iron, for use in the local forges. On the other hand, the lower horizon, exemplified by the "Old Bed" and "Mine 21", contains immense bodies of ore of very complicated structure. The enormous size of the ore bodies is ascribed by Mr. B. T. Putnam, with much soundness of reasoning, to the spreading apart of the strata in an S fold, and in support of his view he presents very instructive sections. One of these sections is annexed (Fig. 4).




SECTION THROUGH MILLER PIT.
MINEVILLE, NEW YORK.

FIG. 4.

"Old Bed" and "Mine 21", practically one mine, shipped together in the census year 395,864 tons, and their total product was then estimated to have been 3,584,000 tons. The ores of this lower horizon are higher in iron, ranging between 57 and 67 per cent. They have also a very high phosphorus ratio, ranging between 0.689 and 2.428. The ores of this horizon owe their phosphorus clearly to the presence of an unusual amount of apatite, this mineral being in places so abundant in the ore as to have been mined for its own sake.

South of Lake Superior there is a great Archæan area, extending from the lake southward into Wisconsin, and flanked on the east by the Paleozoic rocks of the Michigan basin, and on the west partly by the Lower Silurian sandstone and partly by the older copper-bearing rocks of the Keweenawan. The central part of this area is chiefly a region of gneisses, with hornblende schists, which by Foster and Whitney were assigned to the Archæan, and later, by Major Brooks, Professor Irving, Credner, and myself have been provisionally considered Laurentian. Lying unconformably on this is the great series of schists which occupy most of the area, and are considered by the same geologists to be Huronian. This upper series is the great iron-bearing member of the Archæan. At or near its base is a heavy quartzite. While the iron series occurs uniformly in the lower part of the Huronian, its structure and character varies in different places. In the Negaunee district it consists of a lower and an upper series. The lower is made up of flag-ores, silicious and ferruginous schists, and some argillaceous and talcose slates and anthophyllitic schists and beds of diabase. The ores of this lower series contain less than 50 per cent. of iron, except where the quartz has been removed and its place taken by rich limonite.

The upper series, which is separated from the lower by a bed of diabase, and a thinner bed of chloritic and talcose slate, contains the rich ores. It consists of a thick mass of banded iron and "jasper", the iron-ore being pure and the jasper generally colored red; and this relation and purity is retained throughout and forms an essential characteristic of the upper series. In places the jasper layers disappear, leaving extensive beds of pure ore; in others the ore gives way to the jasper. In places subsequent chemical action has removed portions of the jasper, while the space thus formed has been filled with limonite in large quantities, as at the Lake Superior mine. The upper part of this upper series has generally a bed of talcose slate, in which the fissile cleavage is wholly independent of the bedding, and which is impregnated with small octahedra of martite. The ore in contact with this slate has the same structure and is impregnated with similar crystals of martite. The upper portion of the upper series consists of beds of rich ore, often granular martite, with talcose schists and very talcose quartzites.

In the western part of Marquette county the ore series occupies the same geological position and exhibits a similar structure, but the ore is to a great extent magnetic, though it is accompanied by more or less important beds of specular ore. The relation between the two varieties appears to be such as would arise from an increased development, toward the west, of the uppermost beds of the upper series of Negaunee, where, as we have seen, there are granular martites which once were magnetites. Just beneath the magnetic beds occurs the banded formation of specular ore and jasper, identical in character with that of the Negaunee district. At several of the mines the disappearance of the jasper layers leaves great workable masses of *pure* specular ore, as at the Republic mine, where the specular predominates over the magnetic.

At this, the western end of the Marquette county ore-field, the basin is narrowed to a width of 2 miles before opening out to form the broad Huronian area of the central part of the Upper Peninsula. The northern edge of the basin is formed by the iron series which, extending along the northern shore of Lake Michigamme, contains the great magnetic deposits of the Michigamme and Spurr Mountain mines. The iron series of the southern edge, containing the Washington, Edwards, Keystone, and Champion magnetic mines bends southwest, forming the southern shore of the lake, and then, with a sharp turn to the southeast, it forms a trough 7 miles long and less than 1 mile wide. In the loop, at the southeastern end, the entire lower and upper series are beautifully represented, culminating in the extensive beds of both specular and magnetic ores of the Republic mine.

It will be seen by reference to table 8 and to the tables of analyses that the mines of the Marquette-Michigamme region shipped 1,346,365 tons of ore ranging from 69 per cent. to 41½ per cent. in iron, with phosphorus ratios ranging from 0.306 to 0.014.

The iron-bearing horizon of the Huronian sweeps from the western end of the Marquette-Michigamme region southward through a little-explored country to the Menomonee region, where it forms several great ranges, only one of which has been extensively developed as yet.

Here it has two extensively-worked ore-bearing horizons, the lower an immense series, many hundred feet thick, of silicious ores, ranging from 50 per cent. downward in iron, and associated with crystalline limestones and argillaceous and talco-chloritic schists. In this series occur the large beds and lenses of very rich, soft specular ore; some of the mines, as the Chapin and Norway, ranking among the great producers of the continent. The mines in the Menominee region shipped 491,347 tons of ore, ranging in iron contents from 67½ per cent. to 38½ per cent., and in phosphorous ratio 0.285 per cent. to 0.000.

West of the Menominee and Michigamme rivers there is a great area of slate rocks, forming in part the upper member of the Huronian. This upper horizon, consisting of quartzites, argillaceous and garnetiferous chloritic slates, bears extensive deposits of compact specular ore, which are worked on a large scale on the Paint river and on the Wisconsin side of the Menominee river. These ores are considered by Major Brooks to be younger than the upper rich ores of the Marquette district. The mines of this horizon were opening, but had not shipped any ore during the census year. Its opening mines were sampled, and the analyses show that the phosphorus ratio is much too high for Bessemer. The iron in the ore as mined for shipment ranged from 46 to 60 per cent., and the phosphorus ratio from 0.288 to 0.072.

The product of the whole Lake Superior region during the census year may be classified as follows:

BY KINDS OF ORE AND ITS CONTENTS IN METALLIC IRON.

| | Tons. |
|---|---|
| *Hematite* (including the hard specular ore of the Marquette region and the soft specular ore of the Menomonee region): | |
| Containing over 60 per cent. of iron | 998,813 |
| Containing from 45 to 60 per cent. of iron | 360,283 |
| Containing under 45 per cent. of iron | |
| Total hematite | 1,359,096 |
| *Magnetite:* | |
| Containing over 60 per cent. of iron | 148,719 |
| Containing from 45 to 60 per cent. of iron | |
| Containing under 45 per cent. of iron | |
| Total magnetite | 148,719 |

| | Tons. |
|---|---|
| *Limonite* (*i. e.*, the Negaunee and allied "soft hematites"): | |
| Containing over 50 per cent. of iron | 315,740 |
| Containing from 40 to 50 per cent. of iron | 14,157 |
| Containing under 40 per cent. of iron | |
| Total limonite | 329,897 |
| Grand total | 1,837,712 |

BY PHOSPHORUS RATIOS (or contents of phosphorus per 100 parts of iron).

[*A partial classification.*]

| | |
|---|---|
| With phosphorus ratio less than 0.05 | 187,896 |
| With phosphorus ratio from 0.05 to 0.10 | 760,693 |
| With phosphorus ratio from 0.10 to 0.35 | 777,317 |
| With phosphorus ratio from 0.50 to 1.00 | 8,080 |
| Total ore classified | 1,733,986 |
| Total ore unclassified | 103,726 |
| Grand total | 1,837,712 |

And by reference to the graphic diagrams, Plates XXIII and XXIV, it will be seen that the Michigan, *i. e.*, the Lake Superior, mines produced nearly one-half of all the Bessemer ore raised in the United States. The Menomonee district alone produced over one-sixth of the whole amount. Further, the Lake Superior mines produced of ore carrying over 60 per cent. iron, 1,147,532 tons, or nearly 56 per cent. of all the ore of this grade mined in the United States; and the ores mined in this region in the census year are estimated to have contained 1,087,600 tons of iron, or 26 per cent. of the iron contained in the entire census year's product of the United States. At the western end of the Upper Peninsula of Michigan another extensive ore-bearing field, discovered by Major Brooks and myself in 1871, has recently been opened at the base of the Huronian. With intervals the ores have been exposed along a line extending from a point about 20 miles west of Lake Gogebic to the Montreal river. This region will begin its shipments in 1885. West of this the same ore-bearing horizon was described about 30 years ago by Colonel Charles Whittlesey, in Ashland county, Wisconsin, and commonly called the Penokie(*a*) range. These ores being undeveloped in the census year were not sampled. They are stated to be high-grade Bessemer ores.

The Archæan mass that rises near the eastern end of the Ozark mountains, in Missouri, consists of areas of granitic rocks, which have been considered to be Laurentian, and of porphyries and porphyry conglomerates, which are probably of Huronian age. The iron ores of Missouri are associated with the porphyries and their conglomerates. Magnetic ores and martite occur in porphyry, in a true vein at Shepherd mountain, with 65½ per cent. iron and 0.020 phosphorus ratio; and in an immense irregular vein or mass, in places 60 feet thick (*b*), in decomposed porphyry, at Iron mountain, where the great ore-body sends countless anastomosing veins of ore abounding in crystals of apatite into the porphyry to form a reticulated mass of ore and rock (Fig. 5). Through the atmospheric removal of the decomposed porphyry, which has been going on probably since the Silurian time, the heavy and indestructible ore-veins have been left to form an accumulating mantle of ore detritus; and thick beds of stratified ore, pebbles, and porphyry-clay, around the base of the mountain, show that the Paleozoic ocean broke upon an already decomposing porphyry mass.

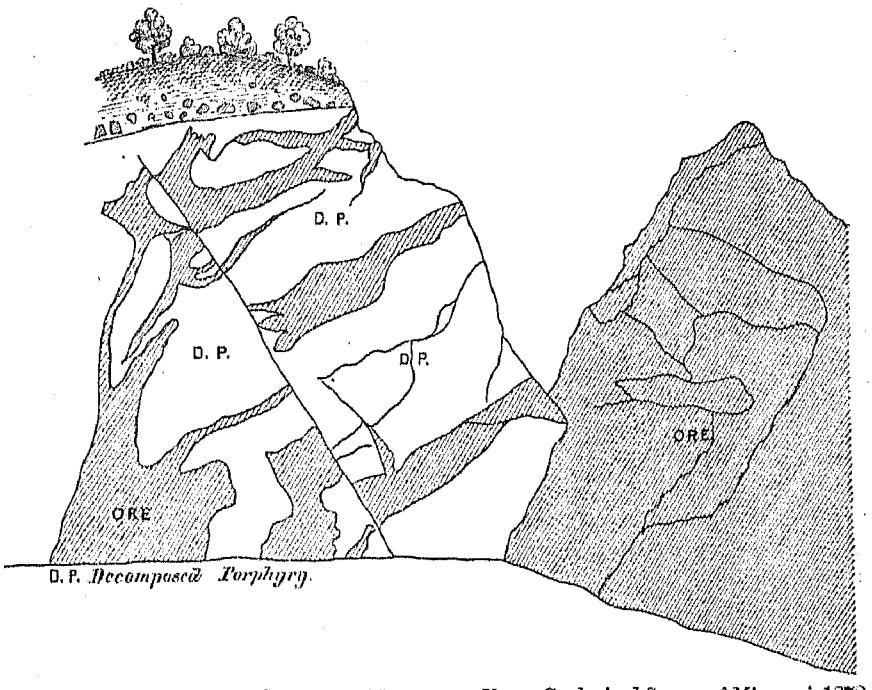



FIG. 5.—SECTION AT IRON MOUNTAIN, MISSOURI. From *Geological Survey of Missouri*, 1872.

The ore of the detritus mantle and of the beds at the base of the mountain has lost nearly all of its phosphorus through the weathering of the apatite crystals.

During the census year the product of Iron mountain was 144,153 tons. Five samples ranged in iron from 59 to 67 per cent., and in phosphorus ratio from 0.008 to 0.674.

*a* Penokie is an uncorrected typographical error for *Pewabic*, the Chippewa word for iron. *b* In 1872.

Pilot knob is a conical hill rising 662 feet above its base. It is composed of bedded porphyries overlaid by porphyry conglomerates, dipping about 13°. Near the top and beneath the conglomerate the hill is traversed by a conformably stratified bed of specular ore. There are really two beds, separated by a slate seam 1 to 3 feet thick. The lower bed, 25 to 40 feet thick, is largely of high-grade ore—52½ to 59½ per cent. iron in two samples, with phosphorus ratios, respectively, of 0.034 and 0.008. The upper bed is of irregular thickness, rising with a jagged upper surface into numerous points into the conglomerate. This upper bed, 6 to 10 feet or more thick, is leaner than the lower. But the sampling shows that it is susceptible of being sorted to produce an ore of 50 per cent. iron, with a phosphorus ratio of 0.050. At other points in this Archæan area the porphyry contains specular ores in irregular masses of unexplored extent. On Cedar hill such a deposit carries an extremely hard and brittle specular ore, which, however, has 66½ per cent. iron, with a phosphorus ratio of only 0.009. It is rather remarkable that the ores of Iron mountain, Pilot knob, and Shepherd mountain—all in porphyry—should be free from manganese. Highly manganiferous ores occur, however, in places in the porphyries of this region.

Magnetic ore occurs in small seams sometimes over 1 foot thick in gabbro-like rocks of Keweenawan age near Agate bay, on the Minnesota shore of Lake Superior. Mr. Willis' sample gave 51.71 iron, with a phosphorus ratio of 0.052.

An examination of the chart giving the geological distribution of the ores will show how generally iron ore in *workable deposits* is distributed. There is scarcely a geological horizon that is not iron-ore bearing in some part of the United States, or even in the Appalachian region alone. The lowest ores above the Archæan appear to be the hematite deposits in the Cambrian.

In Virginia, where the Potsdam sandstone (No. I) becomes slaty toward the bottom, and graduates into reddish and olive shales toward the top, these upper shales contain deposits of hematite, which is silicious and rather low in iron.

Next in importance to the Archæan magnetites of the Appalachian fields stand the limonites, associated with the Siluro-Cambrian limestones and schists. In the Appalachian region—from northern Vermont to central Alabama—there is a limonite-bearing belt of national importance. It occupies the great valley region that forms the depression between the lofty Archæan chain on the east, and the Upper Silurian ridges that form the corrugated front of the great plateau to the west. This great anticlinal depression represents the position of the Cambrian, Canadian, and Trenton formations. In western New England these rocks are highly metamorphosed, and form, as has been finally demonstrated by Professor Dana, the argillites, hydromica-schists, gneisses, quartzites, and limestones of the Taconic. In the central region—in Pennsylvania—they are the magnesian limestones and interbedded hydromica slates, together constituting Formation II of the Pennsylvania survey and the Canadian of Dana, overlaid by the rocks of the Trenton. In Virginia, Formation II consists of more or less dolomitic limestone, with heavy beds of chert and variegated and more or less calcareous slates.

Farther south, in Tennessee, Formation II is represented by the still less metamorphosed sandstones, shales, and thick dolomites of the Knox group. Throughout the length of this belt limonite ores have been known and worked for more than a century. They occur throughout the limestone areas in deposits of clay that are the residuary or leached outcroppings of beds that are interstratified with the limestones or schists and quartzites. In this clay the ore occurs, as a rule, in small pieces in concretionary, massive, earthy, or botryoidal shape. When hollow, as in the concretionary bomb or pot ore, the inner surface is usually glossy and black from a film of oxide of manganese. As a rule, the fractures of these, as of the other forms, except the earthy variety, show the silky fibrous texture due to crystallization. The bombs, which occasionally contain stalactites of limonite—"pipe-ore"—are filled with soft clay or water. The ore thus scattered through the clay has to be washed to effect a separation from this. I believe this is the general character of the ore throughout this long belt. The deposits vary in extent and in the relative abundance of the ore in the clay. They also vary as regards the nature of the inclosing-walls. In some cases, as at Ore hill, in Connecticut, these are both schists; in others, as at the Clove mine, New York, they are both limestone; in others the ore-body may have limestone on one side and schist or quartzite on the other. In some cases, where the bottom of the ore has been reached, it has been found to rest on limestone, *i. e.*, the ore and clay deposits were found to have occupied the position of that part of an original limestone bed which lay above the drainage-level. Where the walls are of clay this frequently retains the original structure of the schists, to the decomposition of which it owes its origin, and where the schist contained veins of quartz these remain in place.

In some cases, as at the Gridley mine, in New York, "horses" of carbonate of iron occur in the ore deposits, and at least in one case, according to Professor Dana, the carbonate shows a stratification quite conformable to that of the neighboring limestones. These limonite occurrences appear to stand in a close genetic relation to the limestone and the hydromica-schists, for they are not only in close proximity to the limestone beds, but they are, as Professor Dana has shown, generally confined to those portions of the limestone belt in which the hydromica-schists occur, and they avoid those parts where the schists are argillitic instead of hydromicaceous.

I do not propose to discuss the numerous hypotheses that have been advanced to explain the origin of the limonite deposits. The view which seems to be advocated by Professor Dana (*a*) is that these deposits have resulted

*a American Journal of Science and Arts*, 1877, p. 135.

from the leaching of beds, either of carbonate of iron or of limestone carrying iron carbonates. This view is favored by the close relation of the deposits to the limestones, and by the occurrence within them of masses of carbonate of iron having their surfaces and cracks occupied by limonite as an alteration product. And also by the fact that beds of iron carbonate exist and are mined in the Hudson river slates near the Hudson. But there are many circumstances that seem to point to a more complicated origin.

Mr. Prime states that, in Pennsylvania, some deposits have resulted from the leaching of hydromica-schists and others from that of limestone, and that it is easy to distinguish the one from the other, because the clays derived from the schist are white, while yellow clay is left by the limestone. He says that the ore in the clays residuary to the limestone are much less regular, and are generally associated with fragments of angular chert, and it is here that the pipe-ore occurs chiefly. On the other hand, the pot- and wash-ore occurs most abundantly when associated with the damourite slate or with the clay resulting from it.

In Virginia this formation does not seem to carry as extensive deposits as in Pennsylvania and New England, and the formation itself appears to have suffered less metamorphism. An excellent illustration of the formation of limonite by pseudomorphism in mass, so to speak, from limestone was observed in some Virginian localities by Mr. Benton. In Wythe county the limonite is closely associated with limestone and shales, both of which were assigned by Professor Rogers to his Formation II (Canadian). The derivation of a cavernous limonite from a limestone (*a*) was observed by Mr. Benton at Hurst bank, in Wythe county. Here a thinly-laminated limestone is much broken; the interstices between the laminæ, as well as the cracks crossing them, are filled with hard limonite; in a further stage the fragments of limestone, inclosed in the limonite network, become smaller, softened, and brown; in the most advanced stage the limestone fragments have disappeared, leaving only cavities containing sandy ocher. Thus the final result is a cavernous limonite, with its cavities containing the residuary insoluble impurities of the limestone.

The hydromica-schists seem to be absent, or at least not prominent, in Tennessee, and the descriptions appear to indicate that the deposits are there more of the nature of those derived from the limestone in Pennsylvania. The great Knox group, corresponding to the Calciferous and Quebec (Dana), consists of Knox sandstone overlaid by Knox shales, and this overlaid by Knox dolomites, the shale and dolomite being the Quebec equivalents.

The residuary ridges and knolls of clay and chert left by the leaching of these rocks contain limonite in nodules, which generally contain cores of pyrites when over 1 foot in diameter. The proportion of ore to clay, where mined, varies from equal amounts down to one-tenth and less.

The conditions all seem to point to the action of several causes; to an infiltration of ferrous solutions, and (1st) the segregation of the oxide in the clays in some cases, and (2d) its precipitation in caverns in others; frequently (3d) to the oxidation of pure carbonates, or (4th) the leaching away of lime carbonate from a ferriferous limestone. In the third of these cases the limonite would be a pseudomorph in mass, after the siderite, and would have a stony, not a silky-fibrous, fracture. In the fourth case the tendency would be to leave a loose, friable ore, also without any evidence of integral crystallization. The formation of stalactites of limonite is evidence of the movement of ferrous solutions and crystallization in cavities.

These Lower Silurian limonite deposits yielded during the census year 1,625,823 tons of ore, ranging, as delivered, between 30 and 58 per cent. metallic iron, and in phosphorus ratio between 0.023 and 3.78. It will be observed by inspecting the analyses that quite a number of localities produced ores sufficiently low in phosphorus to be adapted to the manufacture of Bessemer steel.

The average royalty paid was 47.4 cents, the range being from 8.8 cents to $1 78.

At several points in the great valley in Pennsylvania there occur deposits of magnetic ore, some of which are of great size, that at Cornwall being one of the largest of known deposits. They are associated with limestone beds and with green schists, and are traversed by trap-masses and dikes. They have been considered to be eruptive, but the later views and descriptions of Lesley, Hunt, Frazer, and Willis agree as to their non-eruptive character.

Hunt places them in Roger's Primal slates, but identifies these with Emmon's Lower Taconic, and considers them older than the Potsdam. Professor Lesley states, in a communication to me, that he considers these deposits to have been originally members of the great range of brown hematite deposits in the Auroral limestone (II), which have been metamorphosed into magnetites and specular ores by the traps. And he is inclined to place them in the upper part of the great limestone. His exceptional position in regard to the age of these ores is, he states, influenced by the fact that the limestone belt contains numerous synclinals of Utica and Hudson river shales, and that not only the limestone, but also these overlying synclinals of shales are seen going down beneath the Mesozoic formation, and have, as he believes, been mistaken for Primal slates. Professor Lesley's view of the derivation of these ores from the alteration of the brown hematites by the eruptive trap goes also to explain why similar deposits are not found in New Jersey and Virginia, where the conjunction of traps and brown hematite is wanting.

The ores are peculiar in that they contain copper in quantities of some economic importance; also in the frequent presence of cobalt in the associated sulphurets. They are also rather exceptional as magnetites, in that they are very low in phosphorus. Out of twenty-three commercial samples collected by Mr. Willis, in only four

*a* Unfortunately no analyses were made to show to what extent the limestone was ferriferous, if at all.

did the phosphorus ratio rise to one-tenth of one per cent. If these ores are the alteration products of the brown hematites, which have a phosphorus ratio almost uniformly above one-tenth of one per cent., the partial elimination of this most persistent element has to be accounted for. On the other hand, copper and cobalt occur in the brown hematites of the upper part of the great limestone.

The magnetic ore mines of the Mesozoic sandstone belt in Pennsylvania produced in the census year 402,554 tons of ore, ranging in iron contents from 38 to 60 per cent., and in phosphorus ratio from 0.017 to 0.202.

The only representatives of the ores of Canadian age in the interior of the continent are the very numerous and important deposits in southern Missouri. Here the lower magnesian limestone of Swallow, to a greater or less extent, represents the Canadian. It consists of four magnesian limestones 190 to 350 feet thick, and three interstratified sandstones from 50 to 125 feet thick. In this series, but especially associated with the third sandstone, occur the widespread deposits of specular ores. Many of the ore-bodies are of large size, containing many thousands of tons. The ore is on the sandstone, or separated from it by clay and fragments of chert. It is overlaid by clay, with chert and sandstone fragments. The form of deposit is more or less circular or elliptical in horizontal section.

Throughout this part of southern Missouri the first and second magnesian limestones have disappeared. They have unquestionably been dissolved away by the action of water and carbonic acid operating continuously on a region that seems to have been above the sea since Paleozoic times. The result of this action is visible in the great mantle of residuary clay, chert, and sandstone fragments that cover southern Missouri to a considerable depth.

In the progress of this leaching process the drainage must have been to an enormous extent through subterranean channels. The ore-bodies are overlaid only by residuary clay and chert, and give evidence of considerable disturbance on their outskirts, the otherwise horizontal sandstone strata often bending downward to pass under the ore and forming a circular outcrop around it (Fig. 6).

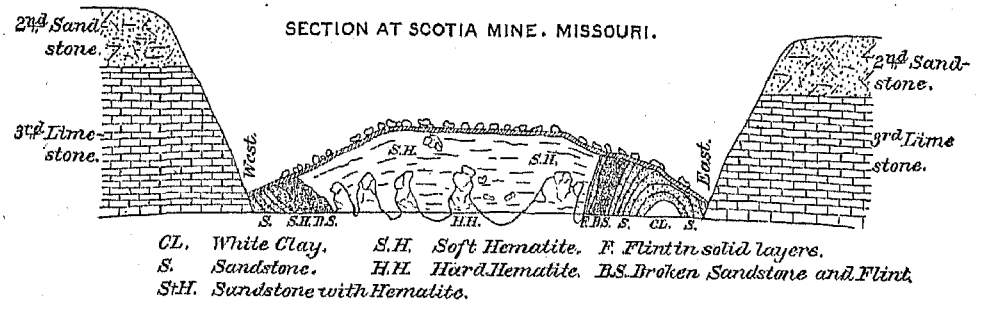



FIG. 6.

With all the variations of occurrence of the ore-bodies of this region, the conditions all seem to me to point to their having been formed in the channels or wells of this downward drainage, through which the surface-waters, carrying the soluble constituents of the formerly overlying limestones of the group, passed into the still lower drainage-channels (caves, etc.) of the underlying limestone; and to the later caving in of the sandstone into these washed-out cavities was due the disturbance on the outskirts of the ore and the tilting of the surrounding sandstone. The ore in these deposits is a hard, compact, bluish, specular variety; this is their normal character. They are associated with soft red hematite and sometimes with limonite, which are considered by Dr. Schmidt (*a*) to be products of alteration of the specular ore. Considering the great extent of country that has been subjected to the leaching process outlined above, it should seem that these deposits of southern Missouri must be very numerous and rank in importance with the limonites of the great Appalachian valley. In the census year there were mined 184,635 tons of ore of this class, ranging in iron contents from 46 to 66 per cent., and in phosphorus ratio from 0.031 to 0.221.

We have seen that the ores associated with the sandstones of the lower magnesian limestone group are specular and red hematite. In the second and third magnesian limestones in southern Missouri there are numerous occurrences of limonite ores. They are found in regular crevices, pockets, and cavities, from the smallest size to very large dimensions, either on or very near the surface of the limestone. The surface of the limestone underneath the ore-bodies is exceedingly irregular, rising into points and sinking into deep holes, and the rock is softened and altered in a way that shows it to have been exposed to the dissolving action of water. The ore itself is stalactitic in structure, and the whole appearance is that of deposits formed in limestone cavities.

Spathic iron ores occur in the great limonite mines in the limestones of Canadian age, either as residuary portions of former more extensive carbonate deposits, or of secondary formation by replacement. This form of ore, which is rather unusual in this country, occurs and is worked on a considerable scale in the slates of Hudson river or Cincinnati age, near the city of Hudson, on the Hudson river. It has been described by Raymond as forming beds 12 to 16 feet thick, resembling a fine-grained, dark-gray silicious limestone. Mr. Putnam's sampling of a stock pile of 2,000 tons at the furnace gave 41.41 per cent. iron, with a phosphorus ratio of 0.384.

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(*a*) *Geological Survey of Missouri*, 1873, p. 66.

Next in importance to the Lower Silurian limonites stand the hematite ores of Clinton age—the fossil or a
dyestone ores.

The persistent occurrence of this ore in this horizon is one of its characteristics; for although it does not occur everywhere in the Clinton, its absence is rather the exception than the rule east of the Mississippi. In New York, beginning at the extreme west, we find it absent at Niagara, where the Clinton is represented by only 4 feet of shale and 25 feet of superincumbent limestone. Going east, already on the Genesee we find 80 feet of Clinton, consisting of two beds of limestone and two of shale, with a bed of ore between the lowest shale and its overlying limestone.

Farther east, in Oneida, Herkimer, and Montgomery counties this group is from 100 to 200 feet thick, consisting essentially of greenish shales; the limestones disappear or are represented only by some calcareous b
sandstones; and two beds of ore appear, one 2 feet and the other 15 inches thick. Along the Appalachian range the ore of this horizon assumes great economic importance from its proximity to the metallurgical coal and centers of iron manufacture.

In Pennsylvania the length of the line of outcrop is immensely increased by its zigzag winding around the many anticlinal and synclinal folds that corrugate the central part of the state. In this part of the range the Clinton thickens to over 2,000 feet of greenish shales. In these there occur several layers of red ore, some of which are due to the impregnation of sandstone layers, while others are alterations of seams of ferriferous limestone. From 1 to 3 feet appears to be the range of thickness of the workable beds.

The principal ore-beds of the Clinton group, as given for Snyder county by the Second Geological Survey of Pennsylvania, are as follows: c

"*Sand vein ore*", the highest, which is a fossiliferous limestone, often nearly destitute of iron, but in places rich enough to yield 20 and even 40 per cent. iron, usually soft along the outcrop and always hard below drainage.

The *Danville ore beds*, a group of fossiliferous limestone beds impregnated with iron and close together. It is rare that any one of them reaches a thickness of 3 feet, and all of them are softened a varying number of yards from the surface down the dip, and in proportion to its gentleness.

The *Block ore-bed*, 1 to 12 feet thick, lies 150 feet lower.

The highly-esteemed *Bird's-eye fossil ore*, 6 to 14 inches thick in the 500 feet of olive shales forming the lower part of the Clinton group.

In Virginia and West Virginia, though less explored, the Clinton ores are known to have locally a much greater development than in Pennsylvania. In the latter state, in Grant, Hardy, and Pendleton counties, they rival the d
deposits of Alabama, and range from 3 to 30 feet in thickness. In Virginia, while these ores are generally less than 20 inches thick, they thicken in Lee and Wise counties to several feet.

Here should be included the hematite beds, 12 to 18 inches thick, forming part of the grand anticlinal arch at Clifton forge, and belonging, according to W. B. Rogers, to the Medina. In Tennessee, instead of 2,000 feet of Clinton shales, we find from 100 to 300 feet only.

Near the Georgia line a section given by Safford represents 136 feet. It consists of greenish shales with numerous calcareous seams, for the most part thin, several of which are altered to hematite, some of them being workable ore beds varying from 1½ to 5 feet in thickness. By folding and faulting, the outcrops are reduplicated in parallel ridges, and in places brought into the closest proximity to the coal. The Clinton, passing across the northwestern corner of Georgia and entering Alabama, assumes here again great economic importance. Beds of e
these ores 7 feet thick were worked during the census year, and later discoveries of much greater size are reported.

At the mines of the Eureka furnace occurs an aggregate of 34 to 37 feet of ore, ranging from 30 to 54 per cent. metallic iron, in three beds, separated by 3 feet and 15 feet of sandstone. Wherever the workings have gone to the drainage-level the ore has been found to give place to a more or less ferruginous limestone. The percentage of metallic iron ranges between 31 and 58 per cent., and the phosphorus ratio from 0.081 to 3.31.

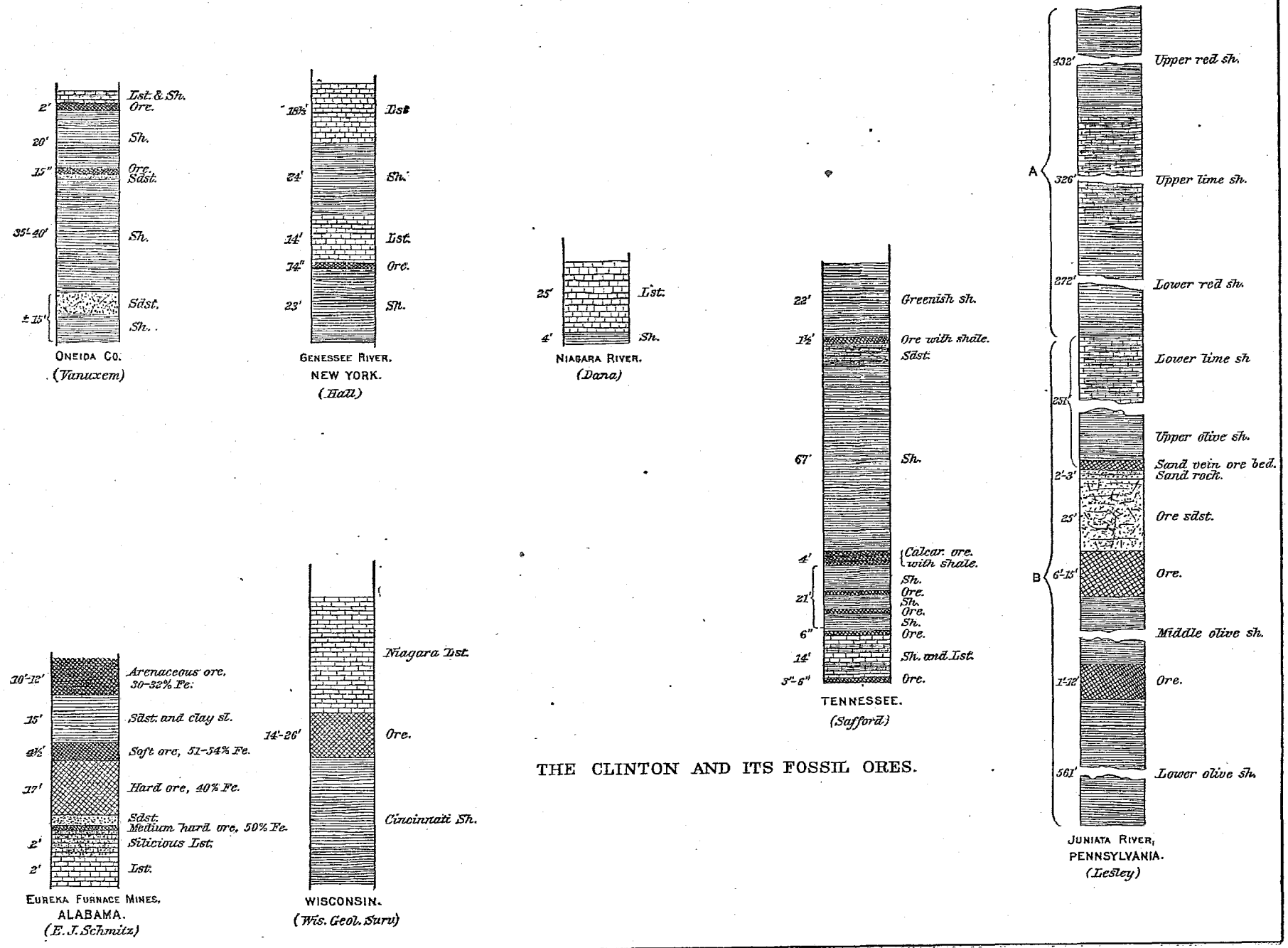
Long-continued exposure seems to eliminate some of the phosphorus, for pieces lying loose in the soil and ore-gravel generally contain less than 0.10 per cent. phosphorus to 100 per cent. of iron. The Clinton is known in the interior of the continent as an iron-bearing horizon, only in Wisconsin, Kentucky, and Ohio. In Wisconsin the well-known mines of Dodge county are worked in one of the finest and most extensive deposits known. Here 14 to 26 feet thickness of ore lies between the Cincinnati shales and the Niagara limestone. In Kentucky the ores of f
this horizon are represented and were formerly worked in Bath county. The ore is here fossiliferous and more or less hydrated, so that it is rather a limonite. In Ohio it is known in three counties, and has been somewhat, but unsuccessfully, worked, as it is calcareous and apt to be lean.

The Clinton ore deposits have in common:

1st. Association with more or less heavily bedded olive shales, which owe their greenish color to ferrous silicates.

2d. Occurrence of the ore only above drainage-level, and change from ore to more or less ferriferous limestone below that level.

At various points, especially in Pennsylvania, and more particularly in Blair county, extensive deposits of limonite occur in caverns in the Lower Helderberg limestones.




THE CLINTON AND ITS FOSSIL ORES.

FIG. 7.

The next iron-ore bearing horizon is the Oriskany, as developed in the middle Appalachians. In Pennsylvania a local deposits of more or less silicious limonite occur in this sandstone in the middle and at the top, and also in its associated shales. But the greatest development of Oriskany ores is in Virginia. They occur at numerous points, and are best represented in the mines of the old Dolly Ann furnace, and at Longdale, on Brushy mountain, and again at Lowmoor. At these places the ore varies from 10 to 30 and even 40 feet in thickness, and is separated from the sandstone by beds of stiff clay. These Oriskany limonites differ from those of the Siluro-Cambrian deposits in being silicious, while the latter are aluminous. The ore-bearing character of the Oriskany appears to be best developed where it is immediately overlaid by the shales of the Hamilton period, where, as in Virginia, the rocks of the Corniferous period are absent. The ore ranges from 32 to 52 per cent. metallic iron, and from 0.075 to 2.331 per cent. phosphorus ratio. The samples from the great mines at Lowmoor and Longdale gave, respectively, 43 b and 44 per cent. iron, and 48 and 52 per cent. iron.

The shales of the Hamilton period contain workable ores in Pennsylvania. In the Marcellus shales at some points, as in Perry county, the ore reaches, locally, a thickness of 12 to 14 feet. It is a loose limonite, imbedded in clay above the drainage-level, but below that level it changes to a hard, blue carbonate of iron. Mr. McCreath's analyses give 35 to 43 per cent. iron, with a phosphorus ratio ranging from 0.179 to 0.281.

In Pennsylvania the Hamilton sandstone (Montebello) also carries ore often with a thickness of about 2 feet, and more or less fossiliferous. In Virginia the Devonian shales are highly charged with pyrites, which within the zone of oxidation gives rise to great amounts of copperas and alum shale, and sulphurous and chalybeate waters, but the local occurrences of iron-ore are of inferior quality.

The same may be said of the formation in Tennessee, where it is more bituminous and thinner. c

A peculiar fossil-ore, very fossiliferous, and known as Mansfield ore, occurs in the Chemung, in Pennsylvania, and has been mined at several points with a thickness of 1½ to 3 feet.

Formation IX—the Catskill—contains some impure ore in small quantities in Virginia.

In Pennsylvania the Mauch Chunk red shales (XI) just beneath the millstone-grit, are topped by a plate of carbonate of iron, known as the "Red-ore bed". This occurs throughout northern and western Pennsylvania, but has been successfully worked only in Fayette county. In Virginia, where this formation consists of red, green, and yellowish shales, with argillaceous limestones, nodular carbonates of iron also occur. In the interior of the continent the sub-Carboniferous consists mainly of limestones. In western Kentucky and Tennessee there occur large amounts of residuary limonite, resting on the lowest sub-Carboniferous limestone—the Protean of Safford. It occurs as pots, strings, pipe-ore, and honeycomb-ore, scattered through deposits of clay and chert often 100 feet d thick. This is doubtless the insoluble residuary ruin of a great thickness of formerly *superincumbent* limestone strata.

In Kentucky the sub-Carboniferous limestone on the Kentucky and Red rivers carries on its top a carbonate ore, known as the "lower limestone ore", which is sometimes as much as 3 feet thick. It occurs in jointed blocks, which are changed to limonite excepting a core of carbonate. In Ohio the sub-Carboniferous limestone carries a good block-ore on its upper surface, which, together with occasional kidneys of ore in the overlying clays, has been mined in connection with the associated limestone, which was used for furnace-flux, but it does not appear to be sufficiently permanent and thick to be mined alone.

In central and western-central Missouri the sub-Carboniferous consists of limestones and sandstones. One of the sandstones, or probably different sandstones, carries a bed of red hematite ore, varying from 1 to 5 feet thick. This varies from highly ferruginous sandstone to pure ore. Coherent deposits of limonite occur in the Upper Osage e river in the Encrinital limestone, and are among the most important sources of limonite in the state. They have the character of ores formed in cavities in the limestone. An ore-sheet, a few inches thick, mixed with pebbles, and known as Guinea-fowl ore, occurs at points in the Conglomerate XII, and has been mined to a very limited extent, but is practically worthless.

The ores of the Carboniferous period may be divided into two classes, viz: Ores occurring in the shales; ores occurring in connection with the limestones.

Doubtless the iron-stones of this age occur coextensively with the Coal Measures; but they are known and more or less worked only in parts of the great Carboniferous area. In different counties of Pennsylvania and Ohio these ores occur at various horizons in workable beds.

The most important known occurrences of iron-stones in the Coal Measures in Pennsylvania appear to be the f following:

I. The ferriferous limestone in the western part of the state, and belonging a few feet below the lower Kittanning coal in the Lower Coal Measures. This limestone, which varies from 4 to 25 feet in thickness, has frequently its upper portion, varying from 6 inches to several feet, altered to limonite, which is known as "buhrstone" ore. In some places the ferriferous limestone is replaced for its entire thickness, 20 feet or more, by ore. Frequently the shales just above the limestone also yield "ball-ore".

II. At Johnstown, the "Johnstown ore-bed", 2 feet thick, 71 feet above the upper Freeport coal.

III. In Fayette county there are five beds of lump and flag clay iron-stone within 25 feet below the Pittsburgh coal. Two more occur overlying the Mahoning sandstone, besides the Pridevale beds underlying it. There are also the Stratford beds overlying the conglomerate.

a The carbonaceous carbonate ore—"blackband"—which has played such an important part in the history of iron-making in Great Britain, has been found in several localities in this country—in Alabama, West Virginia, Ohio, and Kentucky. In North Carolina blackband occurs with the Triassic coal. In Alabama a 12-inch seam was worked in the census year. It contained 29 per cent. of iron with a phosphorus ratio of 0.058, and was associated with a black shale carrying 8 per cent. of iron with a phosphorus ratio of 1.372.

In Louisa county, Kentucky, there is known a seam of blackband 16 inches thick overlaid by 15 inches of black bituminous shale. It is known at several points in West Virginia. Mr. S. P. Sharples gives the analysis of a raw blackband from a persistent seam 9 miles from Charleston, in West Virginia, viz, 31.46 per cent. iron, 0.41 sulphur, and 0.25 phosphorus.

b Mr. Proctor, of the Kentucky survey, states that the Coal Measures of the Western Coalfield contain persistent beds of ore of workable thickness, sometimes 6 feet thick, and carrying from 35 per cent. to 42 per cent. of iron in the unroasted ore.

With one or two very slight exceptions, all the ore now mined in Ohio comes from the Lower Coal Measures. There are three important horizons of carbonate ores, the working thickness of which over large areas is often 6 feet with local swelling to 18 or 19 feet. These horizons are, according to Professor Orton—

1. Upper Freeport coal; the main blackband horizon; here belong also clayband ores.
2. Forty feet below Lower Mercer, interconglomerate limestone; confined to southern Ohio, ["Flag ore," "Boggs ore."]
3. Sharon coal; interconglomerate blackband.

c Kidney ores are mined at various points in Ohio. They are scattered through the shales and fire-clays of 5 or 6 tolerably well marked horizons, in some of which they are quite persistent, viz:

1. Upper Freeport limestone, in southern Ohio.
2. Lower Freeport limestone, in southern Ohio.
3. Kittanning shales, between Kittanning coals.
4. Ferriferous limestone and Clarion coals.
5. Putnam Hill limestone, in southern Ohio.

The ferriferous limestone, celebrated for its "buhrstone" ore, in Pennsylvania, is equally important in southern Ohio, where, in the Hanging-Rock district, it carries in its upper portion 6 to 12 inches of more or less altered carbonate, known in Ohio and Kentucky as "limestone ore".

d Reviewing these horizons as observed by Professor Orton, from whom I have taken the notes on the Ohio ores, we find them to number twelve, distributed through the Lower Coal Measures, and ranging from the Sharon coal to the upper Freeport, viz:

Upper Freeport coal.
Upper Freeport clay.
Upper Freeport limestone.
Lower Freeport limestone.
Kittanning shales.
Ferriferous limestone.
Putnam Hill limestone.

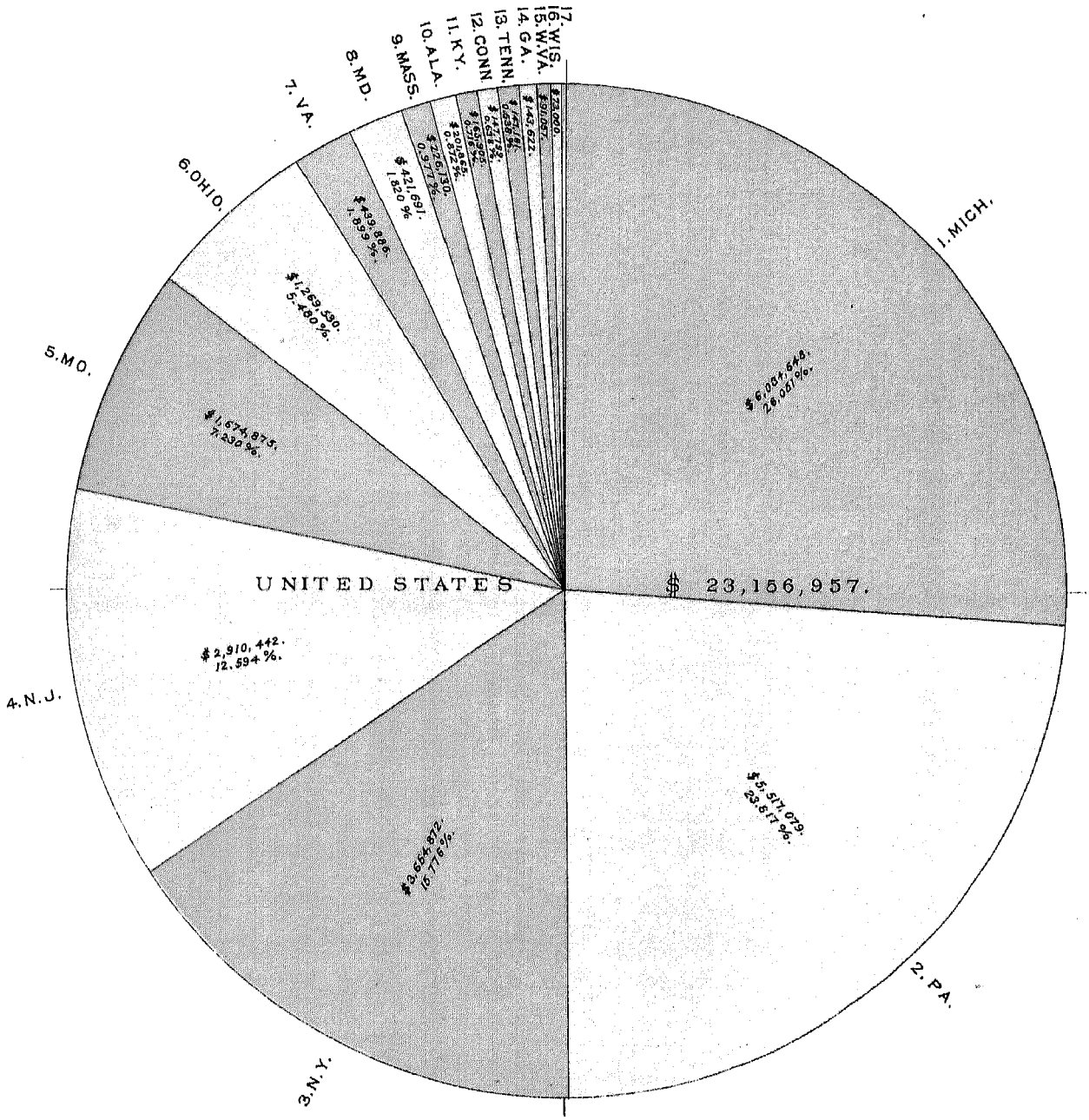
e Upper Mercer limestone.
Mercer shales.
Lower Mercer limestone { Above. / Below.
Interval between Mercer and Sharon groups, Sharon coal.

A hematite occurs in layers of concretions in the inclined beds of the Trias in Moore county, North Carolina; and in Chatham county of the same state, a seam of blackband, 18 inches thick, forms the roof of a seam of Triassic coal, and, with black shale, the floor of another. It carries 21 per cent. of iron, with the remarkably low phosphorus ratio of 0.080. The shales above the coal-seams also contain carbonate ball-ore.

In the deposition of the great lignitic groups of the Cretaceous west of the Missouri river conditions existed f similar to a great extent to those which surrounded the formation of the older Coal Measures; and we also find clay-ironstone nodules in the fire-clays that accompany the lignite.

In some places, according to Mr. Putnam, where the fine shales have been removed by waste, and especially by wind, these nodules remain as a residuary, sometimes workable, deposit on the surface of the plains.

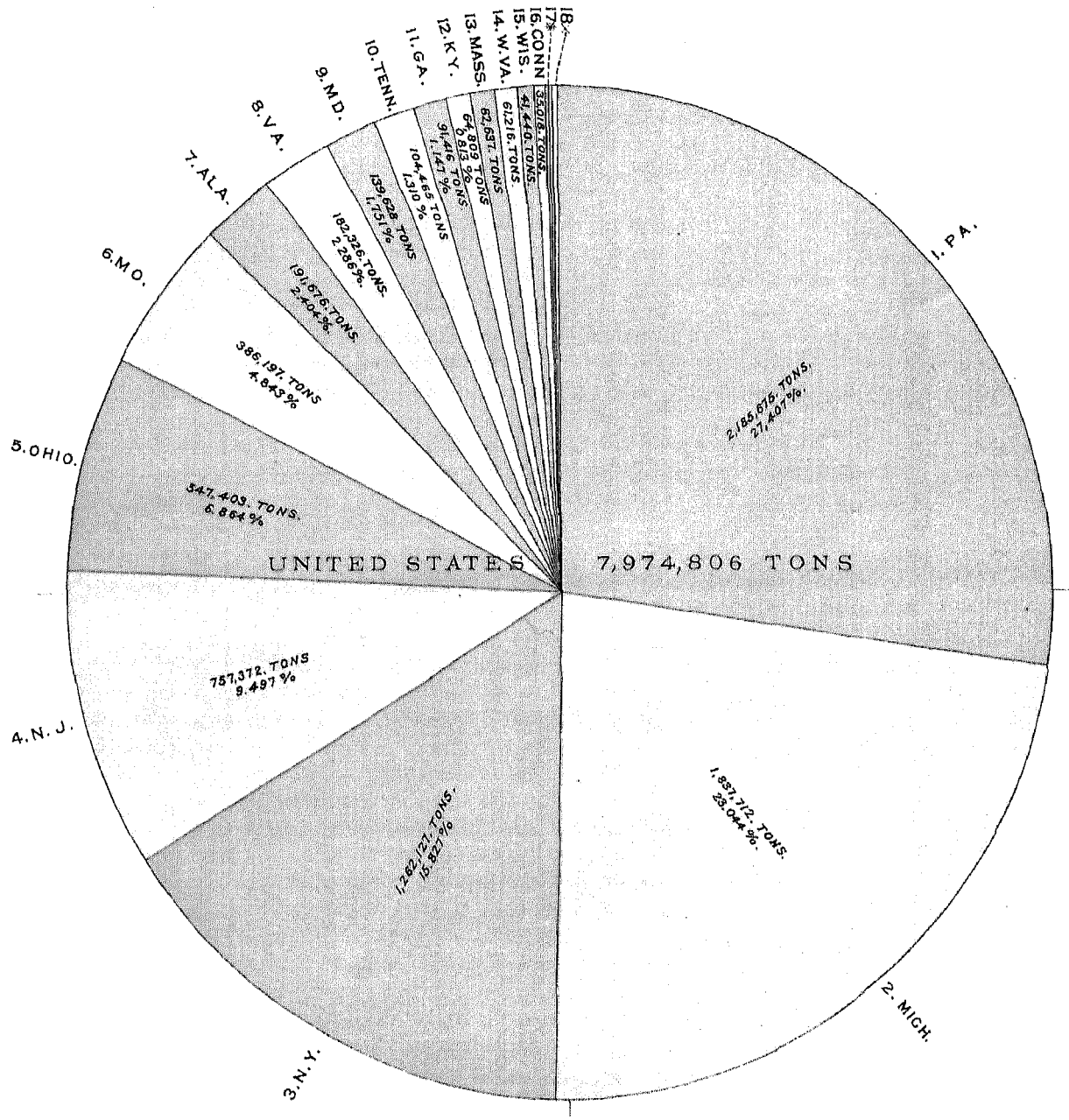
In eastern Maryland, from north of Baltimore to near Washington, District of Columbia, there is a long line of small mines, which have produced clay-ironstone nodules more or less altered to hematite and limonite. These nodules occur in a stiff clay, probably of Mesozoic age. These ores range from 36 to 48½ per cent. iron, and in phosphorus ratio 0.065 to 0.399. The basaltic rocks of the Cascade range exposed to the immense rainfall and luxuriant vegetation of the northern Pacific coast have contributed to the formation of very extensive deposits of bog-ore. That such deposits were forming probably during the Tertiary period is shown by the Prosser mine near Portland, in Oregon. Here a bed of limonite 6 to 8 feet thick, still showing in places more or less the texture of bog-ore, and containing roots and trunks of a former forest-growth, lies upon a bed of basalt and is covered by




17.-a. ME.($ 9,000); b. TEX.($ 8,100); c. DEL.($ 6,553); d. N.CAR.($ 5,285); e. OR.($ 4,669); f. VT.($ 2,750); g. IND.($ 1,018); = $ 37,375.

## VALUE OF THE IRON ORE MINED IN THE CENSUS YEAR, BY STATES.

Julius Bien & Co. Lith.




* 17.a. OR. (6,972); b. ME. (6,000); = 12,972. TONS.
18.a. TEX. (3,600); b. N. CAR. (3,318); c. DEL. (2,726); d. VT. (560); e. IND. (513) = 10,717. TONS.

# IRON ORE MINED IN THE CENSUS YEAR, BY STATES.

James Bien & Co Lith.

many hundred feet of more recent basalt, the whole dipping about 10° to 20° to the westward. Two samples gave a 44.71 and 54.19 iron, and phosphorus ratios respectively of 1.490 and 0.723. Part of the bed is altered to a compact mineral-like brown pitch stone, containing 30 per cent. of iron. Similar ores are forming to day in the great marshes from the chalybeate waters drained from the decomposing basalt of the Cascade range.

Limonite in several varieties, especially bog-ores, occurs in deposits of recent age at many points in the Atlantic states. While this class of ores contributed nothing to the iron industry in the census year of 1880, they were of relatively great importance in the early period of American iron-making. As there can be little doubt that they will become useful ores under the processes of the future, they must count as prospective elements of the national wealth.

It was my original intention to combine with the special canvass of the statistics of the mining industries east of the 100th meridian a more special study of the iron-ore resources of the country at large. The whole b organization of the work was framed to include this investigation by separate observers, and nearly all the field-work was actually finished, when the inadequacy of the census appropriation necessitated an extensive contraction of the plan. Commercial and differential samples had been fully collected of the ores of all mines excepting the carbonate ores of West Virginia.

The original intention of extending complete analyses to the ores of all large mines, and to all others in which for various reasons such analyses might be supposed to have a metallurgical value, was also abandoned, and the complete analyses were stopped at the point at which they had already arrived, with some important exceptions. The scope of the partial analyses was also thenceforth limited largely to the determination of iron and phosphorus. The plan of studying the structural features of the ore-deposits and their genetic phenomena was the one that I gave up with the greatest reluctance; for in a statistical survey of the resources of the United States in iron-ore an c approximative result can be obtained only after obtaining light on a few fundamental points, and especially the following:

1. In the Archæan ores are the "pods" of the Highlands and the "lenses" of Michigan simply isolated masses, of rare occurrence, and in widely-separated horizons, or do they occur grouped near together, in places in overlapping lenses, in others scattered along the same straight or folded plane of bedding, and separated only by greater or less stretches of "barrens" or "pinches"?

2. Regarding our next great reliance for the future—the limonite bodies of the great Appalachian valley—are they limited as ore-producers to the present region of drainage, or has the oxyhydration or mineralization, as the case may be, extended to a greater depth, dependent either upon some former drainage conditions or upon some process acting independently of drainage? d

And do these limonite bodies in depth change to corresponding rich parent bodies of carbonate of iron, or to earthy carbonates containing iron, which remains as an insoluble residue after the leaching away of the former; or, again, are they in some instances produced mainly by the reaction of iron-salts upon limestone, and in others by the rapid decomposition of alkaline hydromica-schists to clays, in which the iron from the decomposed silicates segregates to form fragmentary limonite? Similar fundamental questions remain to be solved with reference to the great specular deposits of Missouri, and, to a certain extent, also, with regard to the "fossil" and related ores. This investigation will doubtless be carried out by the National Geological Survey, within whose domain it falls. But, although much curtailed, there still remain enough results from the sampler's notes, the laboratory work, and the statistical canvass proper to classify very clearly the iron-ore fields and the ore-product of the census year according to its richness in iron and its content of phosphorus, and to present the industry in its broader economic e aspects. This I have attempted to do by means of the following tabular and graphic statements, which, with the exception of plates VII and VIII, were calculated and drawn up by my assistant, Mr. Bayard T. Putnam:

They are:

*Plate VII.*—Map of the United States, showing the geographical distribution of the iron-ore fields. (Faces p. 3.)

*Plate VIII.*—Chart showing the geological distribution of the iron ores in each state. (Faces p. 4.)

*Plate IX.*—Diagram showing the relative values of the ore mined in each state in the census year.

*Plate X.*—Diagram showing the relative amounts of ore mined in each state in the census year.

*Plate XI.*—Diagram showing the relative amounts of the several kinds of ore mined in the United States in the census year. This is a graphic presentation of the totals of table 7.

*Plate XII.*—Diagram showing the relative amounts of each kind of ore mined from each geological horizon in f the census year. This is a graphic presentation of the totals of table 6.

*Table* 6.—Table showing the amount of each kind of ore mined from each geological horizon in each state in the census year. The totals of this table are graphically presented in plate XII.

*Plate XIII.*—Diagram showing the relative amounts of each kind of ore mined in each state in the census year. This is a graphic presentation of table 7.

*Table* 7.—Table showing the amounts of each kind of ore mined in each state in the census year. The details of this table are shown graphically on plate XIII, and its totals are shown graphically on plate XI.

*Plate XIV.*—Map of the United States, showing by different intensities of one tint the relative amounts of ore mined in the census year. A star on this map indicates the "center of total production of iron ore in the census year". (See p. 37.)

a *Plates XV to XXI.*—Maps of different portions of the United States, showing by different intensities of one tint and by figures in different colors the relative total amounts of ore and the relative amounts of each kind of ore mined in each ore-producing county in the census year. These maps exhibit graphically the data contained in table 8.

*Table* 8.—Table showing the amounts of each kind of ore mined in each ore-producing county in the census year. Plates XV to XXI exhibit these data graphically.

*Plate XXII.*—Diagram showing (*a*) a classification of the ore mined in the United States in the census year according to kind of ore and its per cent. of metallic iron, and (*b*) a classification of the total metallic iron in the ore according to kinds and grades of ore which contained it. These diagrams are graphic representations of the b data contained in table 9.

*Table* 9.—Table showing (*a*) a classification of the ore mined in the United States in the census year according to kind of ore and its per cent. of metallic iron, and (*b*) a classification of the total metallic iron in the ore according to kinds and grades of ore which contained it. The data in this table are graphically presented in plate XXII.

*Table* 10.—Table showing a classification of the ore mined in each state in the census year according to kind of ore and its per cent. of metallic iron. The totals of this table are recapitulated in table 9, and are presented graphically on plate XXII.

*Table* 10 *a*.—Table showing a classification of the metallic iron contained in the ore mined in each state in the census year according to kinds and grades of ore which contained it. This table is calculated from table 10. Its totals are repeated in table 9 and appear graphically on plate XXII.

c *Table* 11.—Table showing a partial classification of the ore mined in each state in the census year according to kind of ore and its phosphorus-iron ratio.

*Table* 12.—Table showing the amount of each kind of ore mined in each state in the census year having a sufficiently low phosphorus-iron ratio to be classed as Bessemer ore. These facts are presented graphically on plates XXIII and XXIV.

*Plate XXIII.*—Diagrams showing (*a*) the relative amount of Bessemer ore to the total ore product in the census year, (*b*) the relative amounts of the different kinds of ore in the Bessemer ore product, and (*c*) the relative amounts of Bessemer ore mined in each state. These are graphic presentations of the facts contained in table 12.

*Plate XXIV.*—Diagram showing the relative amounts of the different kinds of Bessemer ore mined in each state in the census year. These facts are presented also in table 12.

d *Table* 13.—Table showing the royalties paid on the different kinds of ore in each state in the census year.

## PLATE VII.

Plate VII is intended to represent the ore-fields of the country to the extent to which they have been shown to be workable in the past. For this purpose the range of the ores is represented by colors selected for the different kinds. Only the limits are represented within which the ores have been proved to exist in more or less sporadic deposits. The progress of the iron industry will extend the limits of these colors to a greater or less extent, but within areas (east of the 100th meridian) which can now be tolerably well defined, as I have stated on page 4. Notably by far the greatest extension will fall to the coloring of the ores of the Carboniferous. But the extension e which can safely be predicted for the coloring of the Siluro-Cambrian ores in Missouri, and the Archæan ores on the south and north sides, of Lake Superior, will be of vast national importance.

Also, the map shows, by the dots in the ore-fields, the proximate position of the mines, or groups of mines, which were working or were sampled during the census year.

One of the most salient facts on plate VII is the lack of any relation between the area of an ore-field and its production; there is also no relation between its area and its capacity for production. Thus in Michigan, whose ore-product represented 23.04 per cent. of the total quantity, and 26.05 per cent. of the total value of the ore-product of the whole United States, the area of the ore-fields is so small as to almost escape observation on the map. On the other hand, Pennsylvania, with a little larger percentage of quantity—27.4 per cent.—and a little smaller percentage of value—23.8 per cent.—is represented by areas aggregating perhaps nearly 300 times that of the f Michigan ore-fields, as represented on the map. Again, of the ore mined in Pennsylvania, more than one-half the quantity came from small colored areas in the southeastern counties, aggregating less than one-fiftieth of the total area colored as the ore-fields of the state.

In seeking the explanation of this fact we find two causes:

First. Although only the Coal Measure areas within which the carbonate ores occur have been worked are colored, their tint covers an immense region. But owing to their low percentage in iron and the necessity of driving off the carbonic acid, these ores contributed only about 11½ per cent. of the total ore tonnage and probably less than 7 per cent. of the value.

Second. The ores of the Carboniferous and Upper Silurian formations lie horizontally, or nearly so, in beds from a few inches to a few feet—rarely 5 feet—thick. Thus the capacity of each mine is only a few thousand tons—five- to twenty-thousand—per acre. On the other hand, the great ore resources of the Siluro-Cambrian, and, in a

much greater degree, of the Archæan formations, are concentrated into deposits of enormous contents underlying a small areas.

PLATE VIII.

I have had plate VIII compiled to accompany my remarks on the distribution of the iron ores in the various geological formations of

The compilation has been made by Mr. Willis from the reports of the various state geological surveys, as well as the difficulties of the case will permit, and will, I think, on the whole, be found correct.

Instances of disputed horizons will be observed, notably the magnetic ores of Pennsylvania that underlie the Triassic sandstone, and are traversed by the traps, and which are in the chart assigned to the Lower Silurian. b The reasons for this are given in the text.

The position assigned to the spathic ore of Roxbury, Connecticut, is also very doubtful.

The known ore deposits of the five great varieties are represented, and where any of the varieties were mined in the state during the census year the tonnage is given.

PLATES IX AND X.

An examination of plates IX and X shows that of the nearly 8,000,000 tons of ore, with a spot value of a little over $23,000,000, nearly one-half the amount, and over one-half the value, was produced by the two states of Michigan and Pennsylvania, and that while Pennsylvania produced the larger part of the tonnage, Michigan is credited with the larger part of the spot value. New York comes third, and New Jersey fourth, both as to tonnage c and value; and these four states—Michigan, Pennsylvania, New York, and New Jersey—together produced more than three-fourths, or, more exactly, 78.2 per cent. of the tonnage, and 75.8 per cent. of the spot value.

Mr. Putnam has tabulated the data contained on these plates, adding the average spot value of the ore of each state, the percentage contributed by the mines of each state to the total metallic-iron product of the United States, and the relative position of each state, first, in the order of tonnage; second, in the order of total value; third, in the order of percentage in metallic iron; fourth, in the order of the average spot value per ton. Four columns have also been added showing for the Bessemer ore product of each state the tonnage, its ratio to the national product of Bessemer ore and to the state's total product, and the order of the state according to the amount of Bessemer ore mined: d

| States. | AMOUNT OF ORE MINED. | | VALUE OF ORE MINED. | | AMOUNT OF METALLIC IRON IN ORE MINED. | | Average per cent. of metallic iron in ore. | BESSEMER ORE MINED. | | | Average spot value of ore per ton. | Order of states according to amount of ore mined. | Order of states according to total value of ore mined. | Order of states according to amount of metallic iron in ore mined. | Order of states according to average per cent. of metallic iron in ore. | Order of states according to amount of Bessemer ore mined. | Order of states according to average spot value of ore per ton. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Tons. | Per cent. of total. | Dollars. | Per cent. of total. | Tons. | Per cent. of total. | | Tons. | Per cent. of Bessemer product. | Per cent of state's product. | | | | | | | |
| Alabama | 191,676 | 2.404 | $201,865 | 0.872 | 97,139 | 2.378 | 50.67 | ..... | ..... | ..... | $1 05 | 7 | 10 | 7 | 8 | .... | 22 |
| Connecticut | 35,018 | 0.439 | 147,799 | 0.638 | 15,769 | 0.388 | 45.03 | ..... | ..... | ..... | 4 22 | 16 | 12 | 16 | 12 | .... | 3 |
| Delaware | 2,726 | 0.034 | 6,553 | 0.028 | 1,082 | 0.026 | 39.67 | ..... | ..... | ..... | 2 40 | 21 | 19 | 21 | 21 | .... | 12 |
| Georgia | 91,416 | 1.147 | 143,622 | 0.621 | 46,964 | 1.140 | 51.37 | ..... | ..... | ..... | 1 57 | 11 | 14 | 11 | 7 | .... | 18 |
| Indiana | 513 | 0.007 | 1,018 | 0.004 | 231 | 0.005 | 45.00 | ..... | ..... | ..... | 1 98 | 23 | 23 | 23 | 13 to 18 | .... | 15 |
| Kentucky | 64,809 | 0.813 | 165,905 | 0.716 | 26,343 | 0.645 | 40.64 | ..... | ..... | ..... | 2 56 | 12 | 11 | 13 | 20 | .... | 9 |
| Maine | 6,000 | 0.075 | 9,000 | 0.039 | 2,700 | 0.066 | 45.00 | 6,000 | 0.28 | 100.00 | 1 50 | 18 | 17 | 18 | 13 to 18 | 7 | 19 |
| Maryland | 139,628 | 1.751 | 421,691 | 1.820 | 59,100 | 1.440 | 42.39 | ..... | ..... | ..... | 3 02 | 9 | 8 | 9 | 19 | .. | 7 |
| Massachusetts | 62,637 | 0.785 | 226,130 | 0.977 | 28,187 | 0.690 | 45.00 | ..... | ..... | ..... | 3 61 | 13 | 9 | 12 | 13 to 18 | .... | 5 |
| Michigan | 1,837,712 | 23.044 | 6,034,648 | 26.051 | 1,094,814 | 26.798 | 59.57 | 948,589 | 43.47 | 51.61 | 3 28 | 2 | 1 | 1 | 2 | 1 | 6 |
| Missouri | 386,197 | 4.843 | 1,674,875 | 7.230 | 231,706 | 5.673 | 60.01 | 287,980 | 13.20 | 74.56 | 4 33 | 6 | 5 | 5 | 1 | 4 | 2 |
| New Jersey | 757,372 | 9.497 | 2,910,442 | 12.564 | 406,953 | 9.961 | 53.73 | 114,841 | 5.26 | 15.16 | 3 84 | 4 | 4 | 4 | 5 | 5 | 4 |
| New York | 1,262,127 | 15.827 | 3,654,872 | 15.776 | 681,534 | 16.680 | 53.99 | 360,821 | 16.55 | 28.58 | 2 89 | 3 | 3 | 3 | 4 | 3 | 8 |
| North Carolina | 3,318 | 0.041 | 5,285 | 0.023 | 1,816 | 0.044 | 55.03 | 2,362 | 0.13 | 80.25 | 1 59 | 20 | 20 | 19 | 3 | 9 | 17 |
| Ohio | 547,403 | 6.864 | 1,269,530 | 5.480 | 211,452 | 5.177 | 38.62 | ..... | ..... | ..... | 2 31 | 5 | 6 | 6 | 22 | .... | 13 |
| Oregon | 6,972 | 0.087 | 4,609 | 0.020 | 3,137 | 0.077 | 45.00 | ..... | ..... | ..... | 67 | 17 | 21 | 17 | 13 to 18 | .... | 23 |
| Pennsylvania | 2,185,075 | 27.407 | 5,517,079 | 23.817 | 980,806 | 24.228 | 45.28 | 448,374 | 20.56 | 20.51 | 2 52 | 1 | 2 | 2 | 11 | 2 | 10 |
| Tennessee | 104,465 | 1.310 | 147,181 | 0.638 | 52,863 | 1.294 | 50.59 | 5,600 | 0.26 | 5.36 | 1 41 | 10 | 13 | 10 | 9 | 8 | 21 |
| Texas | 3,600 | 0.046 | 8,100 | 0.035 | 1,620 | 0.040 | 45.00 | ..... | ..... | ..... | 2 25 | 10 | 18 | 20 | 13 to 18 | ... | 14 |
| Vermont | 560 | 0.007 | 2,750 | 0.012 | 252 | 0.006 | 45.00 | ..... | ..... | ..... | 4 91 | 22 | 22 | 22 | 13 to 18 | .... | 1 |
| Virginia | 182,326 | 2.286 | 439,886 | 1.899 | 86,799 | 2.125 | 47.60 | 6,160 | 0.28 | 3.37 | 2 41 | 8 | 7 | 8 | 10 | 6 | 11 |
| West Virginia | 61,210 | 0.767 | 91,057 | 0.394 | 23,214 | 0.568 | 37.92 | ..... | ..... | ..... | 1 48 | 14 | 15 | 14 | 23 | ... | 20 |
| Wisconsin | 41,440 | 0.519 | 73,000 | 0.316 | 21,784 | 0.533 | 52.56 | ..... | ..... | ..... | 1 76 | 15 | 16 | 15 | 6 | .... | 16 |
| The United States. | 7,974,806 | 100.000 | 23,156,957 | 100.000 | 4,085,418 | 100.000 | 51.22 | 2,181,227 | 100.00 | ..... | 2.90 | .... | ..... | ..... | ..... | .... | .... |

a Among the several factors that enter into the causation of the differences in the average value of the ore at the mines, the most important is the proportion of Bessemer ore (see plate XXIII) in the product of each state, and the relative average richness of the state's total product in metallic iron.

Ohio produced only the relatively low-grade ores of the Carboniferous, and no Bessemer ores, and while her tonnage was 6.864 per cent. of the total tonnage, its value was only 5.480 per cent. of the total value.

On the other hand the product of Missouri was of high grade hematite, nearly three-quarters of which was Bessemer ore; and while her tonnage was 4.834 per cent. of the total tonnage, its value was 7.230 per cent. of the total value.

The importance of this cause is shown, perhaps best, in comparing Ohio with Michigan. As we have seen, b Ohio's tonnage percentage was 6.846, and value percentage, 5.480; on the other hand, the high-grade product of Michigan, one-half of it Bessemer, has a tonnage percentage of 23,044 and value percentage of 26.051, notwithstanding the fact that its product has to be carried over 600 miles by rail, water, and again by rail, to the furnaces of Ohio, Illinois, and Pennsylvania.

It appears from the above table that the first, third, and fifth rank, as regards average spot value of the ore, belongs respectively to Vermont, Connecticut, and Massachusetts. The aggregate product of these three states was less than 100,000 tons, or about one-eightieth of that of the country at large. The high valuation is due partly to the fact that these ores have a special value for car-wheels.

Missouri occupies (after Vermont) the first rank for average spot value, partly because she worked in that year only her richer hematite and magnetite mines, thus taking highest rank for average per cent. of iron in ore, and c partly because three-quarters of the product from these mines was adapted to Bessemer; but the high average spot value was doubtless due mainly to the fact that the owners of Iron Mountain, the largest producers, maintained a high price for their ore.

New Jersey ranked fourth in average spot value of ore, although among the producers of Bessemer ore she ranked seventh as regards proportion of Bessemer to non-Bessemer ore, and fifth as regards total product of Bessemer, and fifth in point of average percentage of metallic iron.

It is noticeable that while New Jersey ranked fourth as to amount of ore mined, it ranked fourth also as to total value, as to amount of metallic iron in the ore-product of the state, and as to average spot value of the ore; and she ranked fifth as to average per cent. of metallic iron in her ore, and also as to the amount of Bessemer ore mined.

d New Jersey ranked below her neighbor, New York, in every one of these points, except the average value of the ore, and here she ranked fourth while New York stood eighth. The difference (New York ores averaged $2 89 as against $3 84 for New Jersey) was due to the proximity of the New Jersey ores to the anthracite fields.

The effect of geographical position on the average spot value of the ore is shown more clearly in Michigan. This state ranked first as to total spot value of ore, first as to amount of metallic iron contributed by its ore product, first as to amount of Bessemer ore mined. She ranked second as to average percentage of iron in the ore, which contained 59.57 per cent. iron as against 60.01 per cent. in the Missouri ore, which ranked first. With all these great advantages, she ranked sixth in point of average spot value of the ore.

On the other hand, the value of these advantages of quality is shown in the comparison of Michigan with Pennsylvania. The latter state, which ranked first in tonnage and second in total value and in amount of metallic e iron contributed by its ore, and second also as to quantity of Bessemer ore mined, but being sixth as regards the ratio of Bessemer ore to non-Bessemer, and eleventh as to average percentage of iron in the ore (45.28 per cent.), it is not surprising to find her ranking tenth as to the average spot value of her ore—$2 52 as against $3 28 for Michigan.

High percentage in iron and qualities that meet the requirements of special demands, especially a low phosphorus ratio, are the conditions that raise the spot value, while cost of transportation tends to lower it.

PLATE XI.

Plate XI exhibits graphically the relative importance of the different varieties of the ores, and should be examined in connection with plates XII and XXII.

f The magnetites, mainly Laurentian (plate XII), form 29.975 per cent. of the tonnage, and contain 32.178 per cent. of the total metallic iron (plate XXII).

Next, the limonites, mainly Lower Silurian, form 26.950 per cent. of the tonnage, and contain 24.319 per cent. of the total metallic iron.

The third great factor, the hematites, mainly Huronian, with 23.791 per cent. of the tonnage, contain 27.717 per cent. of the total metallic iron.

The low-grade carbonate and derivatives, almost wholly from the Coal Measures and sub-Carboniferous, form 11.565 per cent. of the tonnage and contain 8.593 per cent. of the total metallic iron.

And the "fossil" ore, wholly Upper Silurian, form 7.717 per cent. of the tonnage, and contain 7.193 per cent. of the total metallic iron.

It shows that there were mined of the five great varieties of iron ore as follows, as represented in the totals of a table 7:

| Ores. | Tons. | Per cent. of total. |
|---|---|---|
| Magnetite | 2,390,389 | 29.975 |
| Limonite | 2,149,417 | 26.952 |
| Hematite | 1,897,218 | 23.791 |
| Carbonate | 922,288 | 11.565 |
| Fossil | 615,494 | 7.717 |
| Total | 7,974,806 | 100.000 |

b

TABLE 6.—*Iron ore mined in the census year, by geological horizons, by states and by kinds.*

[Compare with plate XII for the graphic presentation of the totals.]

| States. | LAURENTIAN. | | | | HURONIAN. | | | | LOWER SILURIAN. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Limonite. | Hematite. | Magnetite. | Total. | Limonite. | Hematite. | Magnetite. | Total. | Limonite. | Hematite. | Magnetite. | Total. |
| | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* |
| Alabama | | | | | | | | | 110,696 | | | 110,696 |
| Connecticut | | | | | | | | | 35,018 | | | 35,018 |
| Delaware | | | | | | | | | | | | |
| Georgia | | | | | | | | | 44,210 | | | 44,210 |
| Kentucky | | | | | | | | | | | | |
| Indiana | | | | | | | | | | | | |
| Maine | | | | | | | | | | | | |
| Maryland | | | | | | | | | 64,760 | | 218 | 64,978 |
| Massachusetts | | | | | | | | | 62,637 | | | 62,637 |
| Michigan | | | | | 329,807 | 1,359,096 | 148,710 | 1,837,712 | | | | |
| Missouri | | | | | | 201,450 | | 201,450 | 112 | 184,635 | | 184,747 |
| New Jersey | | | 741,864 | 741,864 | | | | | 15,508 | | | 15,508 |
| New York | | | 927,052 | 927,052 | | | | | 145,550 | 94,765 | | 240,315 |
| North Carolina | | | 2,650 | 2,650 | 510 | | 152 | 662 | | | | |
| Ohio | | | | | | | | | | | | |
| Oregon | | | | | | | | | | | | |
| Pennsylvania | | | 152,869 | 152,869 | | | | | 1,084,752 | 15,832 | 405,055 | 1,505,639 |
| Tennessee | | | | | | | | | 15,447 | | | 15,447 |
| Texas | | | | | | | | | | | | |
| Vermont | | | | | | | | | | 560 | | *a* 560 |
| Virginia | | | | | 1,351 | 13,440 | 11,810 | 26,601 | 42,352 | 28,000 | | 70,392 |
| West Virginia | | | | | | | | | | | | |
| Wisconsin | | | | | | | | | 2,240 | | | 2,240 |
| The United States | | | 1,824,435 | 1,824,435 | 331,764 | 1,573,986 | 160,681 | 2,066,431 | 1,624,322 | 323,792 | 405,273 | 2,352,387 |

| States. | UPPER SILURIAN. | | | DEVONIAN. | | | SUB-CARBONIFEROUS. Limonite. | CARBONIFEROUS. Carbonates and derivatives. | MESOZOIC. Carbonates and derivatives. | CENOZOIC. Limonite. | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fossil. | Limonite. | Total. | Fossil. | Limonite. | Total. | | | | | |
| | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* |
| Alabama | 75,218 | | 75,218 | | | | | 5,762 | | | 191,676 |
| Connecticut | | | | | | | | | | | 35,018 |
| Delaware | | | | | | | | | | 2,726 | 2,726 |
| Georgia | 47,206 | | 47,206 | | | | | | | | 91,416 |
| Kentucky | | | | | | | 17,660 | 47,149 | | | 64,809 |
| Indiana | | | | | | | 513 | | | | 513 |
| Maine | | | | | | | | | | 6,000 | 6,000 |
| Maryland | 1,018 | | 1,018 | | | | | | 73,632 | | 139,628 |
| Massachusetts | | | | | | | | | | | 62,637 |
| Michigan | | | | | | | | | | | 1,837,712 |
| Missouri | | | | | | | | | | | 386,197 |
| New Jersey | | | | | | | | | | | 757,372 |
| New York | 85,442 | | 85,442 | | | | | | | 9,318 | 1,202,127 |
| North Carolina | | | | | | | | | | | 3,318 |
| Ohio | | | | | | | | 547,403 | | | 547,403 |
| Oregon | | | | | | | | | | 6,972 | 6,972 |
| Pennsylvania | 283,037 | 6,720 | 290,357 | 212 | 39,224 | 39,436 | | 197,374 | | | 2,185,675 |
| Tennessee | 76,561 | | 76,561 | | | | 12,457 | | | | 104,465 |
| Texas | | | | | | | | | | 3,000 | 3,000 |
| Vermont | | | | | | | | | | | 500 |
| Virginia | | 85,333 | 85,333 | | | | | | | | 182,326 |
| West Virginia | 7,000 | 3,248 | 10,248 | | | | | 50,968 | | | 61,216 |
| Wisconsin | 39,200 | | 39,200 | | | | | | | | 41,440 |
| The United States | 615,282 | 95,301 | 710,583 | 212 | 39,436 | 39,436 | 30,630 | 848,656 | 73,632 | 28,616 | 7,974,806 |

*a* The age of this ore is very doubtful.

TABLE 6 AND PLATE XII.

a Table 6, showing the amounts of iron ore mined by geological horizons, kinds, and states, should be consulted in connection with plate VIII, the geological chart showing the distribution of the various ores in the geological column of the different states, and also with the statistical graphic plate (XII) showing the amounts of ore mined by geological horizons and kinds. The last-mentioned diagram is, as will be readily seen, constructed from the totals of table 6.

It is not necessary to emphasize the fact that neither the table nor the two plates represent the relative capacity of the different horizons or the different states; the special requirements of the iron industry of the period in question and the newness of the ore industry in some of the states, caused the demand to bear very unequally on the production of different varieties of ores and of different geographical areas.

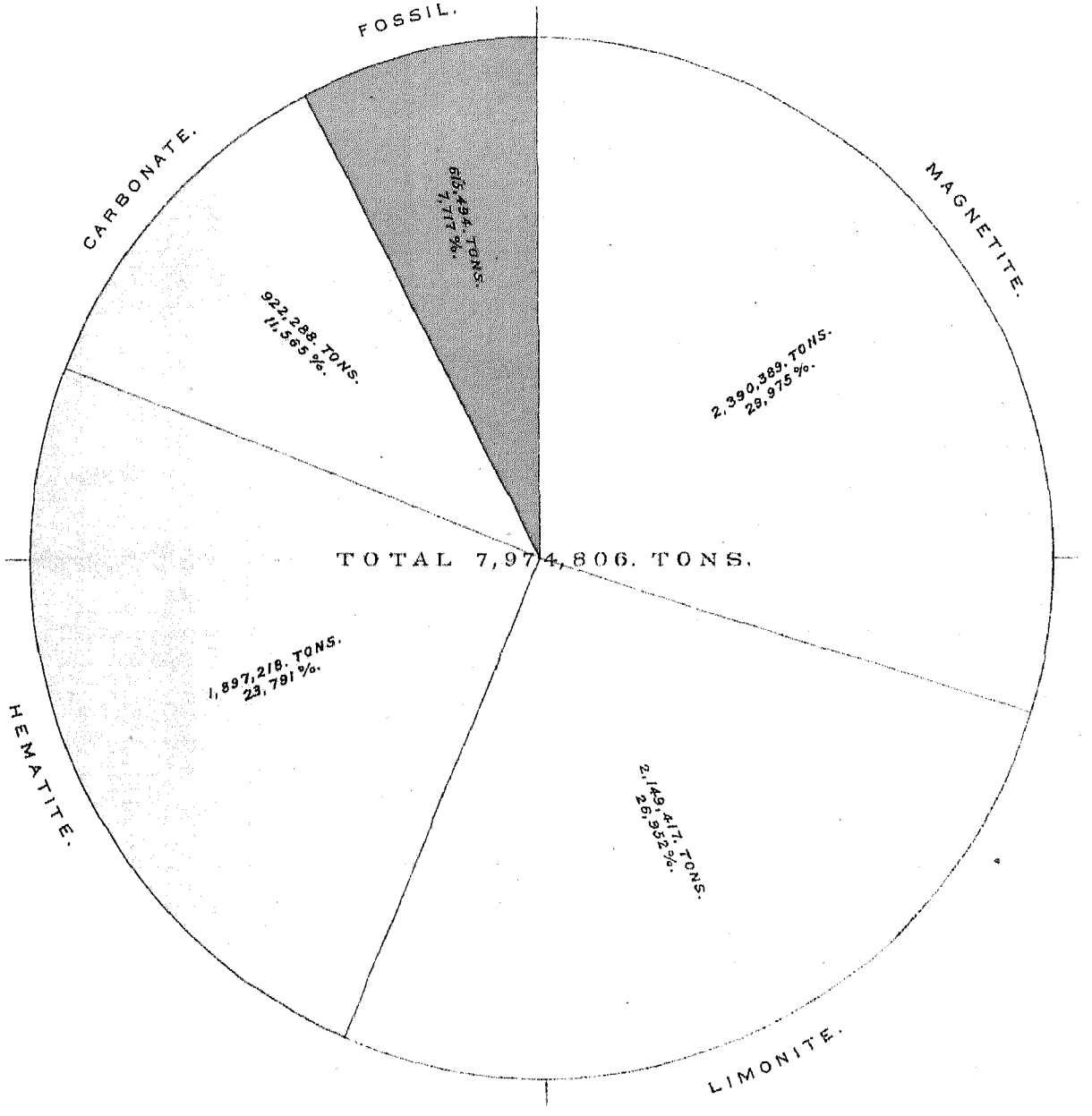
b From these representations, especially from plate XII, it will be seen that nearly one-half of the ore product of the country was mined from the Archæan, the Huronian producing a little more than the Laurentian. The Lower Silurian, essentially the deposits in the Siluro-Cambrian limestone, produced more ore than either one of the members of the Archæan.

Plate XII shows, also, in a very striking manner, that each of the great ore-bearing horizons is remarkable for an immensely preponderating ore which is different from the dominant ores of the other great horizons. Thus the magnetites are peculiarly Laurentian, the specular hematites Huronian, the limonites Siluro-Cambrian, the fossil hematites Upper Silurian (Clinton), and the carbonates almost peculiar to the Carboniferous.

c It is proper to say here that a certain amount of what is shown as Huronian hematite—several hundred thousand tons—is martite, and therefore, while for all commercial purposes it is a hematite, in its geological and genetic relations it is a magnetic ore. Further, the ores classed as Huronian limonites are all derived from hematite, while on the other hand the Lower Silurian magnetites of Pennsylvania are altered limonite bodies.

From this table it appears that the different geological horizons produced of the different varieties as follows:

| | |
|---|---|
| LAURENTIAN: | |
| Magnetite | 1,824,435 |
| Total | 1,824,435 |
| HURONIAN: | |
| Limonite | 331,764 |
| Hematite | 1,573,986 |
| Magnetite | 160,681 |
| Total | 2,066,431 |
| LOWER SILURIAN: | |
| Limonite | 1,624,322 |
| Hematite | 323,792 |
| Magnetite | 405,273 |
| Total | 2,352,387 |
| UPPER SILURIAN: | |
| Fossil hematite | 615,282 |
| Limonite | 95,301 |
| Total | 710,583 |
| DEVONIAN: | |
| Fossil hematite | 212 |
| Limonite | 39,224 |
| Total | 39,436 |
| SUB-CARBONIFEROUS: | |
| Limonite | 30,630 |
| Total | 30,630 |
| CARBONIFEROUS: | |
| Carbonates and derivatives | 848,856 |
| Total | 848,856 |
| MESOZOIC: | |
| Carbonate and derivatives | 73,632 |
| Total | 73,632 |
| CENOZOIC: | |
| Limonite | 28,616 |
| Total | 28,616 |



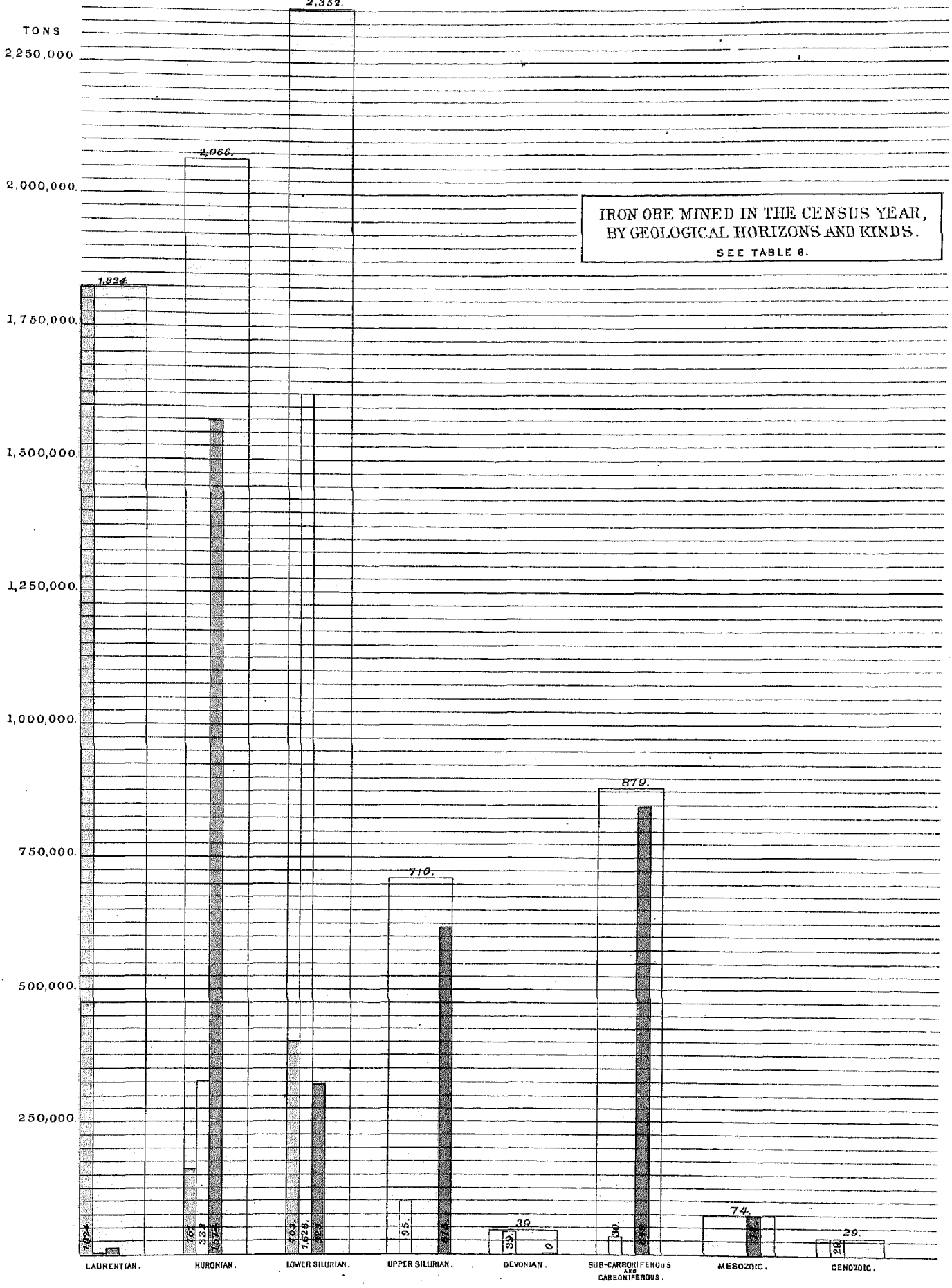

Note: *All the coal measure ores (Carbonates and their derivative limonites) are placed under "carbonates". The Carbonate ores of Maryland are also put in that section.—The specular ores are classed with the hematites.*

## IRON ORE MINED IN THE CENSUS YEAR, BY KINDS.

Julius Bien & Co. Lith.

# IRON ORE MINED IN THE CENSUS YEAR, BY GEOLOGICAL HORIZONS AND KINDS.

SEE TABLE 6.




Magnetite

Limonite or brown hematite

Hematite including specular

Carboniferous and Mesozoic (Maryland) Carbonates and their derivatives

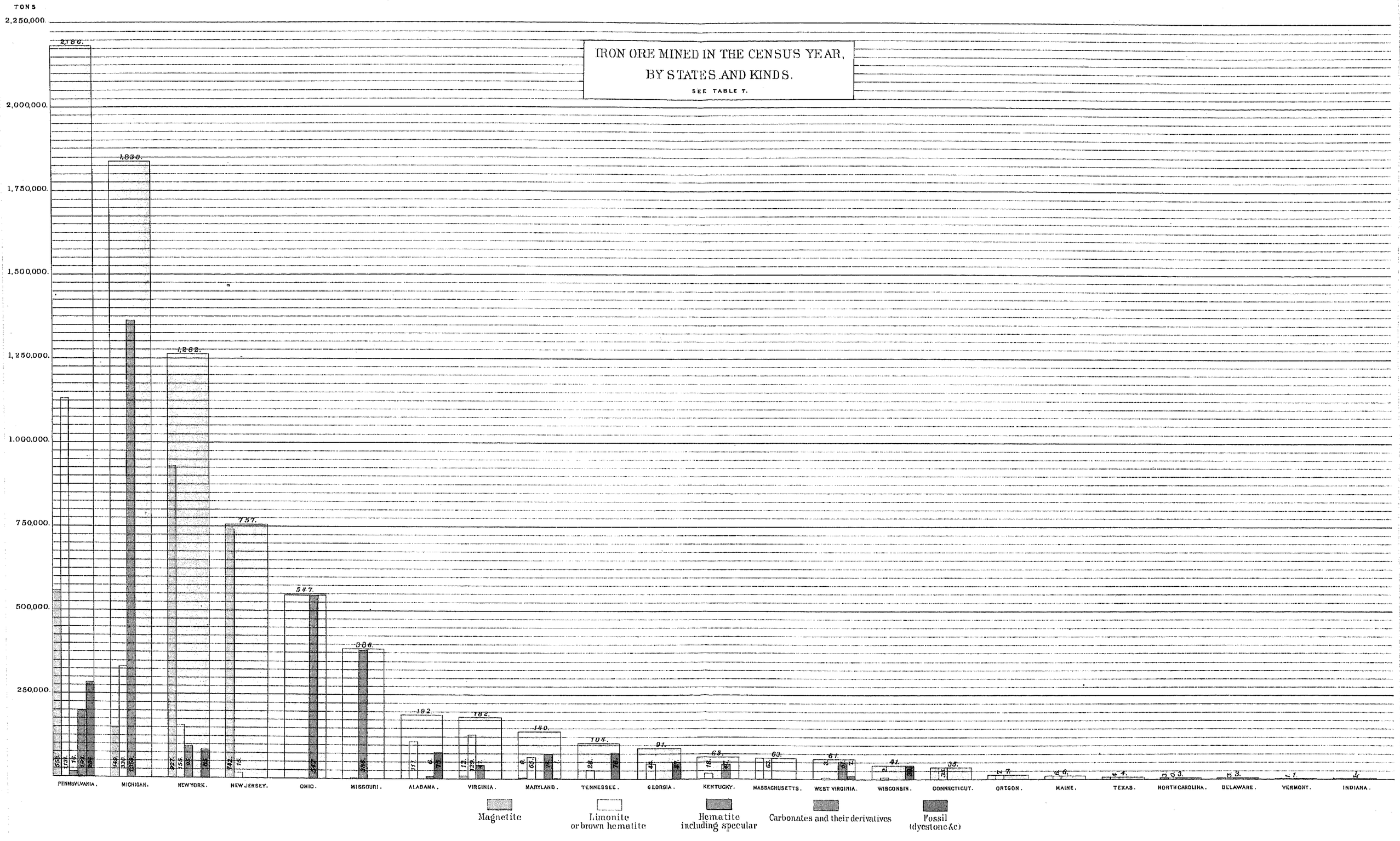
Fossil (dyestone&c)

*The total product of ore of each horizon is shown by the extreme height of the grey column.*
*Note. The figures indicate thousands of tons. 0 is used where less than 500 tons were produced.*

Julius Bien & Co. Lith.

# IRON ORE MINED IN THE CENSUS YEAR, BY STATES AND KINDS.

SEE TABLE 7.




*The total output of a State is shown by the extreme height of its column.*
*Note. The figures indicate thousands of tons. 0 is used where less than 500 tons were produced.*

Julius Bien & Co Lith.

TABLE 7.—*Iron ore mined in the census year, by states and by kinds.*

[Compare with Plate XIII, and, for totals, with Plate XI.]

| States. | Magnetite. | Limonite. | Hematite. | Carbonate. | Fossil. | Total. |
|---|---|---|---|---|---|---|
| | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* |
| Alabama | | 110,696 | | 5,702 | 75,218 | 191,676 |
| Connecticut | | 35,018 | | | | 35,018 |
| Delaware | | 2,726 | | | | 2,726 |
| Georgia | | 44,210 | | | 47,206 | 91,416 |
| Kentucky | | 17,660 | | 47,149 | | 64,809 |
| Indiana | | 513 | | | | 513 |
| Maine | | 6,000 | | | | 6,000 |
| Maryland | 218 | 64,780 | | 73,632 | 1,018 | 139,628 |
| Massachusetts | | 62,037 | | | | 62,037 |
| Michigan | 148,719 | *a* 329,897 | 1,359,096 | | | 1,837,712 |
| Missouri | | 112 | 386,085 | | | 386,197 |
| New Jersey | 741,864 | 15,508 | | | | 757,372 |
| New York | 927,052 | 154,868 | 94,765 | | 85,442 | 1,262,127 |
| North Carolina | 2,802 | 516 | | | | 3,318 |
| Ohio | | | | 547,403 | | 547,403 |
| Oregon | | 6,072 | | | | 6,072 |
| Pennsylvania | 557,924 | 1,130,696 | 15,832 | 197,874 | 283,849 | 2,185,675 |
| Tennessee | | 27 904 | | | 76,561 | 104,465 |
| Texas | | 3,000 | | | | 3,000 |
| Vermont | | | 560 | | | 560 |
| Virginia | 11,810 | 129,076 | 41,440 | | | 182,326 |
| West Virginia | | 3,248 | | 50,968 | 7,000 | 61,216 |
| Wisconsin | | 2,240 | | | 39,200 | 41,440 |
| The United States—Totals | 2,390,389 | 2,148,857 | 1,897,778 | 922,288 | 615,494 | 7,974,806 |
| The United States—Percentages | 29.975 | 26.945 | 23.797 | 11.565 | 7.717 | |

*a* "Soft hematites" (near Negaunee). These ores are more or less hydrated, and are therefore classed for convenience with the limonites, although genetically they belong to the hematites, from which they are derived.

TABLE 8.—*Iron ore mined in the census year, by states and counties and by kinds.*

[Compare with Plates XV to XXI, inclusive.]

| State and county. | Fossil. | Carbonate of the Coal Measures and derivatives. | Hematite. | Limonite. | Magnetite. | Total. |
|---|---|---|---|---|---|---|
| ALABAMA. | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* |
| Bibb | | | | 5,670 | | 5,670 |
| Calhoun | | | | 27,842 | | 27,842 |
| Cherokee | 1,089 | | | 31,907 | | 32,996 |
| De Kalb | 227 | | | | | 227 |
| Etowah | 21,004 | | | | | 21,004 |
| Jefferson | 40,213 | 5,702 | | | | 45,975 |
| Saint Clair | 12,685 | | | | | 12,685 |
| Shelby | | | | 25,787 | | 25,787 |
| Talladega | | | | 5,338 | | 5,338 |
| Tuscaloosa | | | | 14,152 | | 14,152 |
| The state | 75,218 | 5,702 | | 110,696 | | 191,676 |
| CONNECTICUT. | | | | | | |
| Litchfield | | | | 35,018 | | 35,018 |
| DELAWARE. | | | | | | |
| New Castle | | | | 2,726 | | 2,726 |
| GEORGIA. | | | | | | |
| Bartow | | | | 11,353 | | 11,353 |
| Dade | 47,206 | | | | | 47,206 |
| Polk | | | | 32,857 | | 32,857 |
| The state | 47,206 | | | 44,210 | | 91,416 |
| KENTUCKY. | | | | | | |
| Bath | | | | 550 | | 550 |
| Boyd | | 9,306 | | | | 9,306 |
| Carter | | 14,749 | | | | 14,749 |
| Estill | | 1,500 | | | | 1,500 |
| Greenup | | 20,004 | | | | 20,004 |
| Lyon | | | | 8,505 | | 8,505 |
| Powell | | 1,500 | | | | 1,500 |
| Trigg | | | | 8,605 | | 8,605 |
| The state | | 47,149 | | 17,660 | | 64,809 |

TABLE 8.—*Iron-ore mined in the census year, by states and counties and by kinds*—Continued.

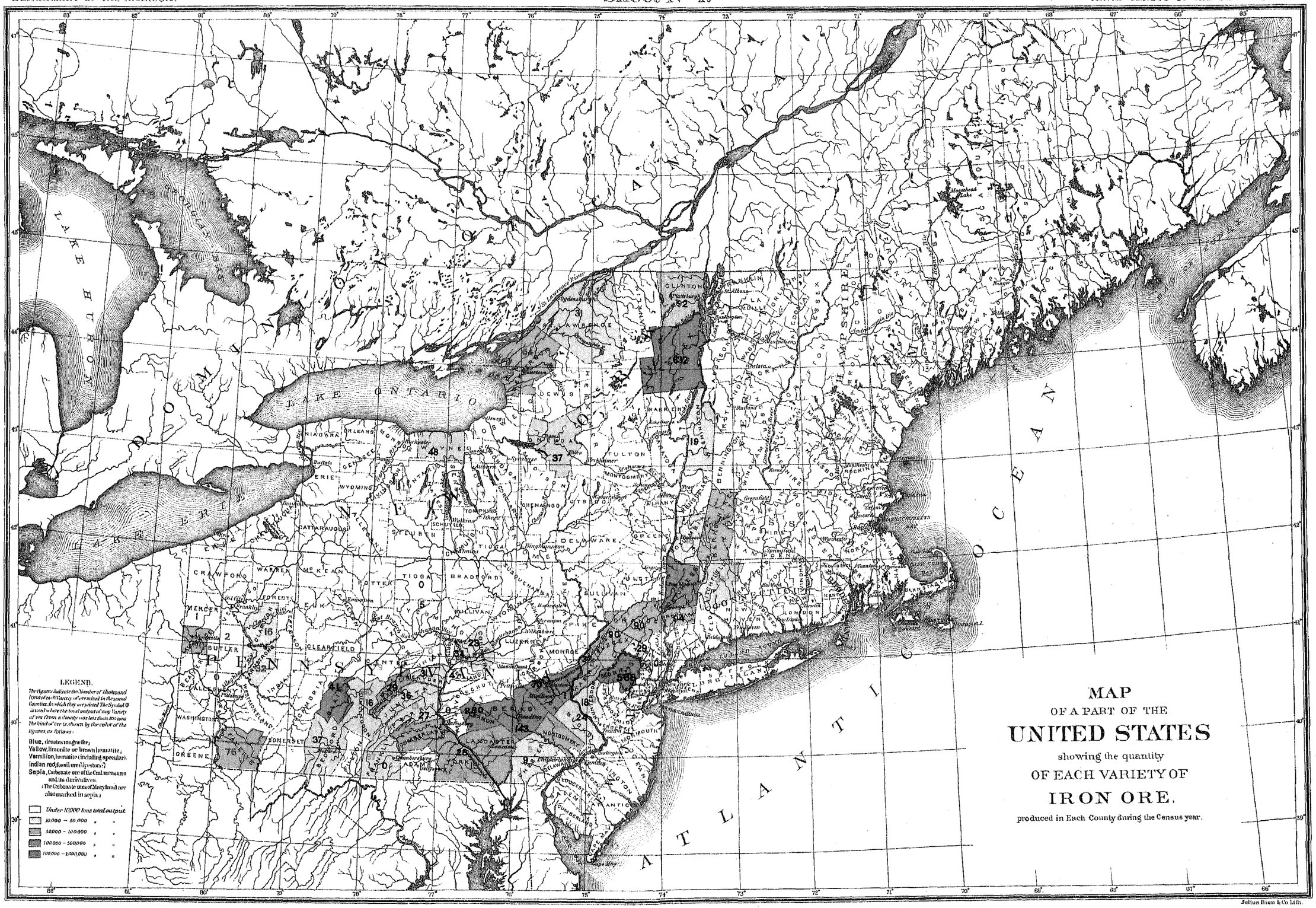
| State and county. | Fossil. | Carbonate of the Coal Measures and derivatives. | Hematite. | Limonite. | Magnetite. | Total. |
|---|---|---|---|---|---|---|
| INDIANA. | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* |
| Martin | | | | 513 | | 513 |
| MAINE. | | | | | | |
| Piscataquis | | | | 6,000 | | 6,000 |
| MARYLAND. | | | | | | |
| Anne Arundel | | *a* 6,184 | | | | 6,184 |
| Alleghany | 1,018 | | | 3,494 | | 4,512 |
| Baltimore | | *a* 40,533 | | 23,309 | | 63,842 |
| Carroll | | | | 17,134 | 218 | 17,352 |
| Cecil | | | | 2,016 | | 2,016 |
| Frederick | | | | 18,166 | | 18,166 |
| Harford | | *a* 196 | | 81 | | 277 |
| Howard | | *a* 14,675 | | | | 14,675 |
| Montgomery | | *a* 25 | | | | 25 |
| Prince George | | *a* 12,019 | | | | 12,019 |
| Washington | | | | 560 | | 560 |
| The state | 1,018 | 73,632 | | 64,760 | 218 | 139,628 |
| MASSACHUSETTS. | | | | | | |
| Berkshire | | | | 62,637 | | 62,637 |
| MICHIGAN. | | | | | | |
| Marquette | | | 867,749 | 329,897 | 148,719 | 1,346,365 |
| Menominee | | | 491,347 | | | 491,347 |
| The state | | | 1,359,096 | 329,897 | 148,719 | 1,837,712 |
| MISSOURI. | | | | | | |
| Crawford | | | 87,033 | | | 87,033 |
| Dent | | | 58,878 | | | 58,878 |
| Franklin | | | 8,064 | | | 8,064 |
| Gasconade | | | 1,120 | | | 1,120 |
| Iron | | | 57,297 | | | 57,297 |
| Phelps | | | 29,320 | | | 29,320 |
| Saint Francois | | | 144,153 | 112 | | 144,265 |
| Washington | | | 214 | | | 214 |
| The state | | | 386,085 | 112 | | 386,197 |
| NEW JERSEY. | | | | | | |
| Bergen | | | | | 280 | 280 |
| Hunterdon | | | | 1,540 | 18,086 | 19,627 |
| Morris | | | | 500 | 507,921 | 508,420 |
| Passaic | | | | | 29,166 | 29,166 |
| Sussex | | | | | 589,065 | 589,065 |
| Warren | | | | 13,468 | 36,746 | 50,214 |
| The state | | | | 15,508 | 741,864 | 757,372 |
| NEW YORK. | | | | | | |
| Essex | | | | | 631,807 | 631,807 |
| Clinton | | | | | 92,166 | 92,166 |
| Columbia | | | | 18,224 | | 18,224 |
| Dutchess | | | | 126,654 | | 126,654 |
| Jefferson | | | 64,111 | | | 64,111 |
| Oneida | 37,052 | | | | | 37,052 |
| Orange | | | | 672 | 90,070 | 90,742 |
| Putnam | | | | | 94,117 | 94,117 |
| Richmond | | | | 9,318 | | 9,318 |
| Saint Lawrence | | | 30,654 | | | 30,654 |
| Washington | | | | | 18,892 | 18,892 |
| Wayne | 48,390 | | | | | 48,390 |
| The state | 85,442 | | 94,765 | 154,868 | 927,052 | 1,262,127 |
| NORTH CAROLINA. | | | | | | |
| Catawba | | | | | 52 | 52 |
| Cherokee | | | | 516 | | 516 |
| Guilford | | | | | 1,680 | 1,680 |
| Lincoln | | | | | 250 | 250 |
| Mitchell | | | | | 720 | 720 |
| Surry | | | | | 100 | 100 |
| The state | | | | 516 | 2,802 | 3,318 |

*a* The carbonate ores of Maryland are not Carboniferous, but as they are the only carbonate ores mined in the census year which are not of that age, they have been placed in this column for the sake of compactness of the table.

*b* Including 2,500 tons residue from Franklinite.

# Sheet No. 1.






## MAP
OF A PART OF THE
## UNITED STATES
showing the quantity
OF EACH VARIETY OF
## IRON ORE.
produced in Each County during the Census year.

Scale

Julius Bien & Co Lith.

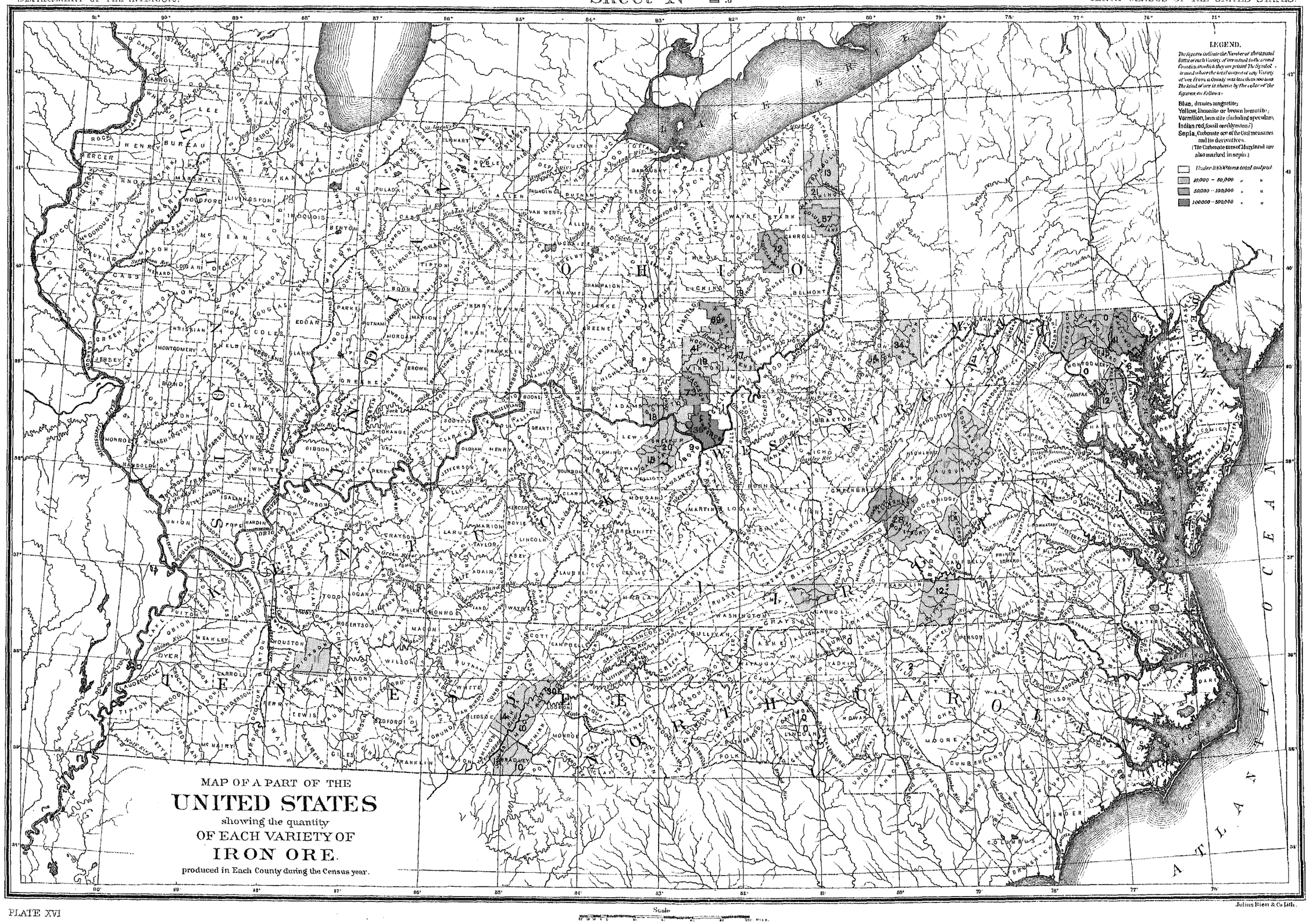



PLATE XVI

Julius Bien & Co. lith.

DEPARTMENT OF THE INTERIOR.

Sheet No. 3.

TENTH CENSUS OF THE UNITED STATES.

# MAP
OF A PART OF THE
# UNITED STATES
showing the quantity
OF EACH VARIETY OF
# IRON ORE
produced in Each County during the Census year.

LEGEND.

The figures in and to the Northeast of Illinois and Missouri each Variety of ore found in the several Counties, for which they are printed. The symbol 0 is used where the total output of any Variety of ore from a County was less than 500 tons. The kind of ore is shown by the color of the figures as follows:

Blue, denotes magnetite;
Yellow, limonite or brown hematite;
Vermilion, hematite (including specular);
Indian red, fossil ore (clinestone)
Sepia, Carbonate ore of the Coal measures and its derivatives.
(The Carbonate ores of Maryland are also marked in sepia.)

Under 10000 tons total output
10,000 - 50,000 " "

Scale:

PLATE XVII.

Julius Bien & Co. Lith.

DEPARTMENT OF THE INTERIOR.

# Sheet No 4.

TENTH CENSUS OF THE UNITED STATES.

PLATE XVIII.

Julius Bien & Co. Lith.

DEPARTMENT OF THE INTERIOR.

# Sheet Nº 5.

TENTH CENSUS OF THE UNITED STATES.

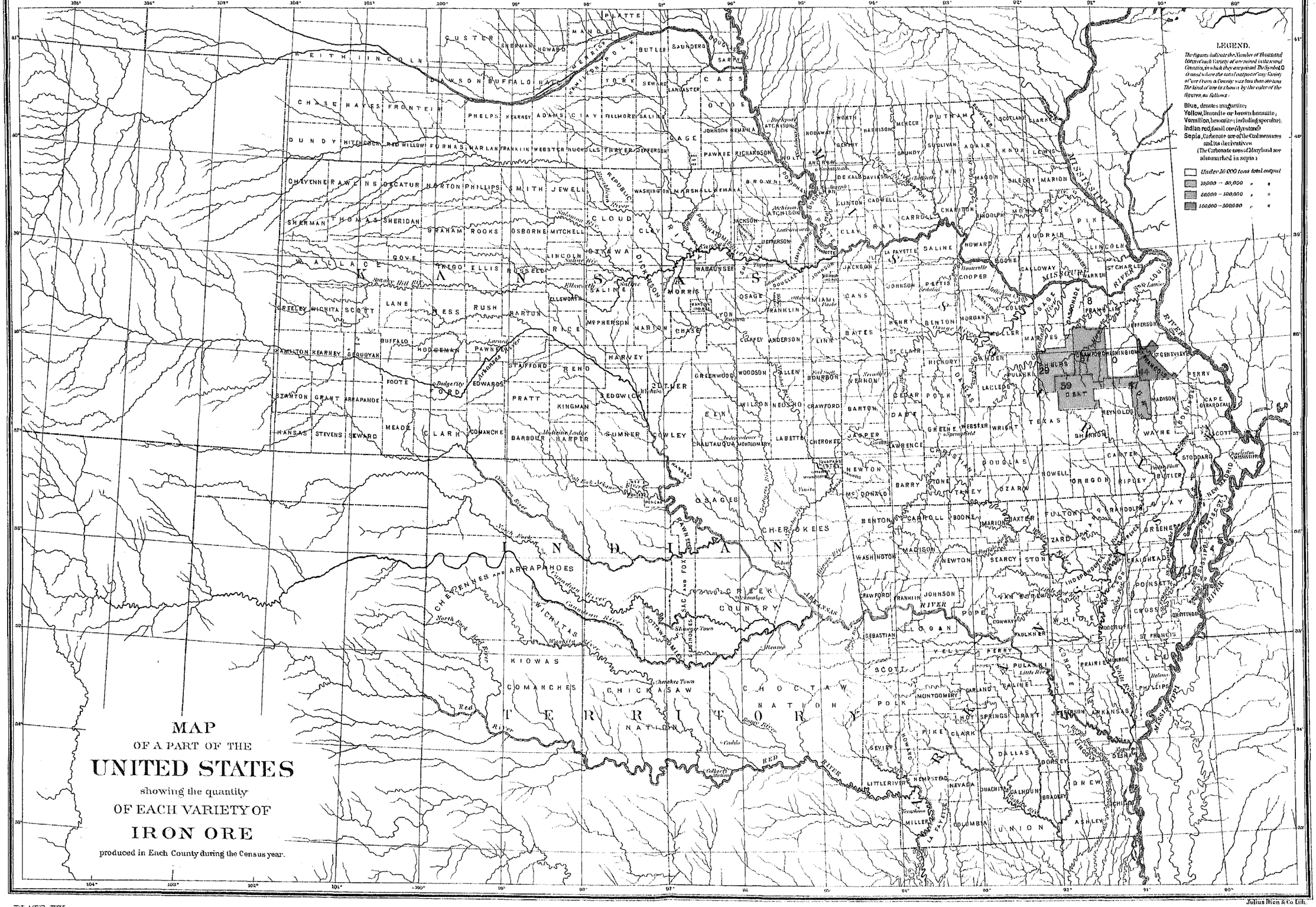



PLATE XIX.

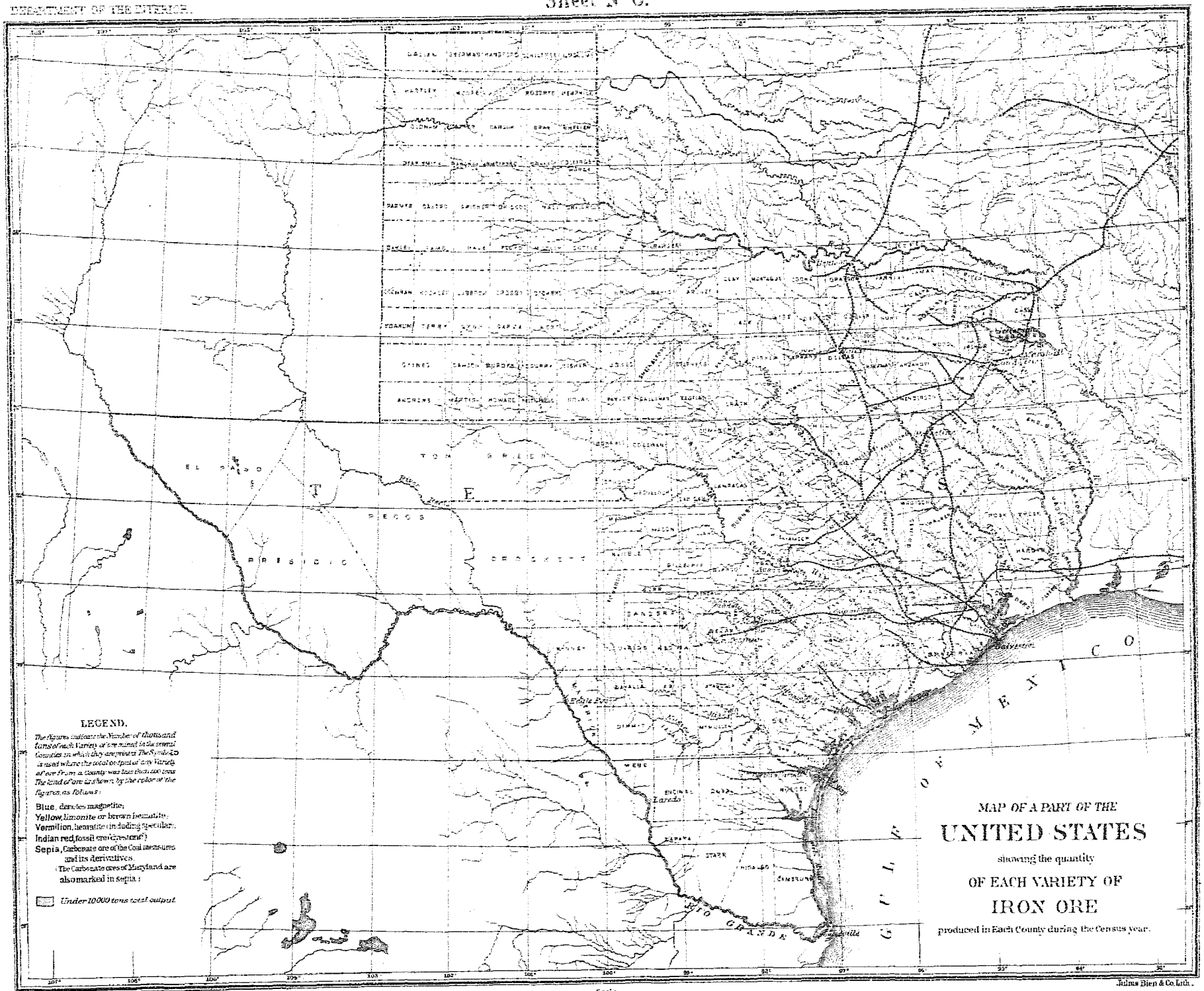
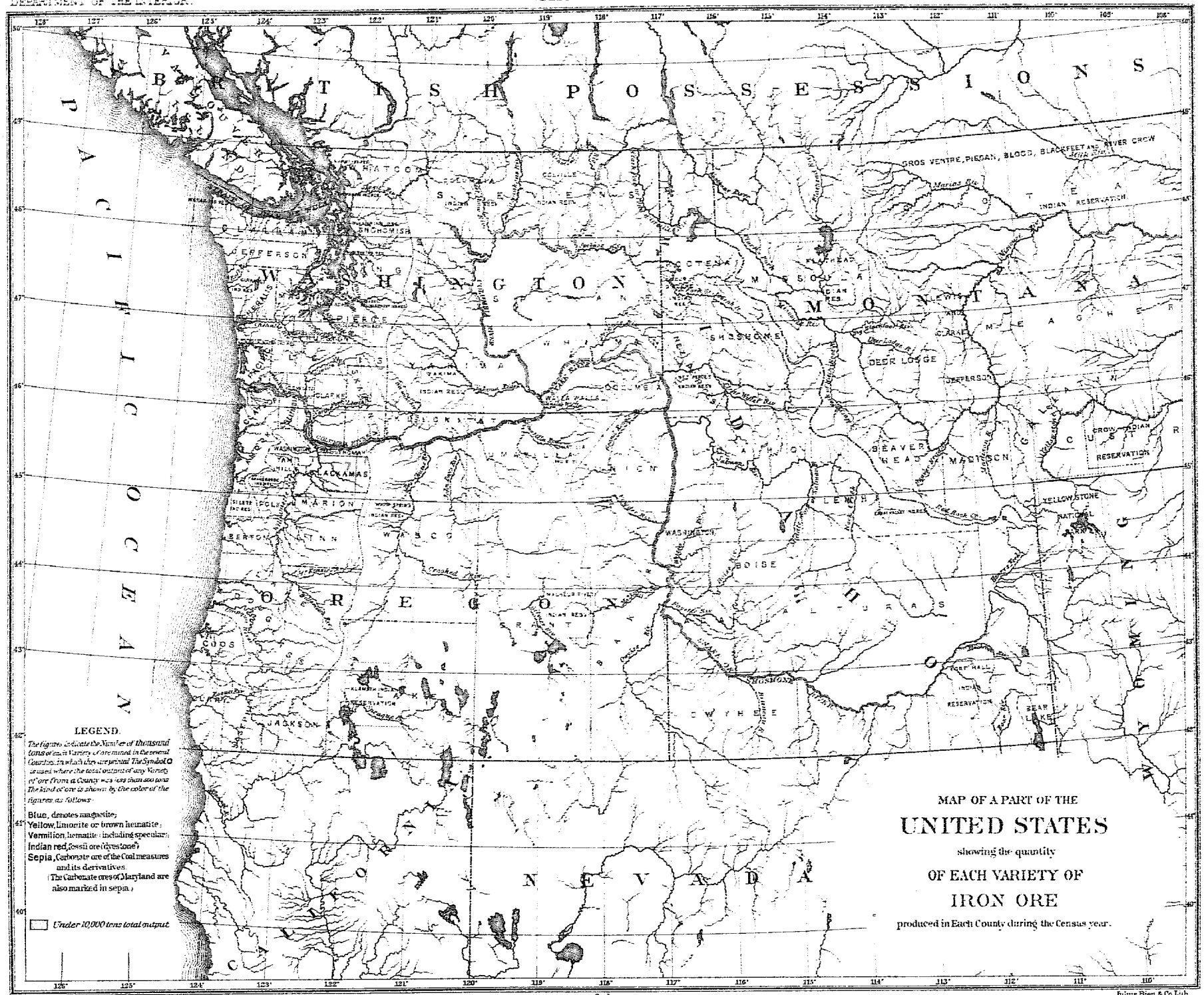

LEGEND.
The figures indicate the Number of thousand tons of each Variety of ore mined in the several Counties in which they are placed. The Symbol 10 is used where the total output of any Variety of ore from a County was less than 10,000 tons. The kind of ore is shown by the color of the figures, as follows:
Blue, denotes magnetite;
Yellow, limonite or brown hematite;
Vermilion, hematite (including specular);
Indian red, fossil ore (rogenstone?)
Sepia, Carbonate ore of the Coal measures and its derivatives.
(The Carbonate ores of Maryland are also marked in sepia.)
Under 10000 tons total output.
MAP OF A PART OF THE
UNITED STATES
showing the quantity
OF EACH VARIETY OF
IRON ORE
produced in Each County during the Census year.
Scale.
Julius Bien & Co. Lith.

PLATE XX.




LEGEND.

*The figures indicate the Number of thousand tons of each Variety of ore mined in the several Counties in which they are printed. The Symbol ○ is used where the total output of any Variety of ore from a County was less than 500 tons. The kind of ore is shown by the color of the figures as follows:*

Blue, denotes magnetite;
Yellow, limonite or brown hematite;
Vermillion, hematite (including specular);
Indian red, fossil ore (dyestone);
Sepia, Carbonate ore of the Coal measures and its derivatives.
(The Carbonate ores of Maryland are also marked in sepia.)

□ *Under 10,000 tons total output.*

# MAP OF A PART OF THE UNITED STATES

showing the quantity

OF EACH VARIETY OF

IRON ORE

produced in Each County during the Census year.

Julius Bien & Co. Lith.

PLATE XXI.

TABLE 8.—*Iron ore mined in the census year, by states and counties and by kinds*—Continued.

| State and county. | Fossil. | Carbonate of the Coal Measures and derivatives. | Hematite. | Limonite. | Magnetite. | Total. |
|---|---|---|---|---|---|---|
| OHIO. | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* |
| Athens | | 17,000 | | | | 17,000 |
| Columbiana | | 56,940 | | | | 56,940 |
| Cuyahoga | | 1,224 | | | | 1,224 |
| Gallia | | 680 | | | | 680 |
| Hocking | | 40,740 | | | | 40,740 |
| Jackson | | 73,423 | | | | 73,423 |
| Lawrence | | 136,464 | | | | 136,464 |
| Mahoning | | 20,636 | | | | 20,636 |
| Muskingum | | 8,654 | | | | 8,654 |
| Perry | | 69,373 | | | | 69,373 |
| Scioto | | 17,837 | | | | 17,837 |
| Stark | | 500 | | | | 500 |
| Trumbull | | 12,735 | | | | 12,735 |
| Tuscarawas | | 72,388 | | | | 72,388 |
| Vinton | | 18,800 | | | | 18,800 |
| The state | | 547,403 | | | | 547,403 |
| OREGON. | | | | | | |
| Clackamas | | | | 6,972 | | 6,972 |
| PENNSYLVANIA. | | | | | | |
| Adams | | | | 560 | | 560 |
| Allegheny | | 350 | | | | 350 |
| Armstrong | | 31,557 | | | | 31,557 |
| Bedford | 37,369 | | | | | 37,369 |
| Berks | | | | 150,074 | 145,880 | 304,954 |
| Blair | 40,036 | | | 114,278 | | 154,914 |
| Bucks | | | | | 24,192 | 24,192 |
| Butler | | 2,318 | | | | 2,318 |
| Carbon | | | | 852 | | 852 |
| Centre | | | | 8,935 | | 8,935 |
| Chester | | | | 5,031 | 9,006 | 14,037 |
| Clarion | | 15,705 | | | | 15,705 |
| Columbia | 22,588 | | | | | 22,588 |
| Cumberland | | | | 75,915 | | 75,915 |
| Dauphin | | | 1,120 | 1,956 | 56 | 3,132 |
| Fayette | | 76,140 | | | | 76,140 |
| Franklin | | | | 36,558 | 56 | 36,614 |
| Huntingdon | 15,027 | | | 10,186 | | 26,113 |
| Juniata | 35,729 | | | | | 35,729 |
| Lancaster | | | | 78,850 | | 78,850 |
| Lawrence | | 70,206 | | | | 70,206 |
| Lebanon | | | | 5,629 | 280,000 | 285,629 |
| Lehigh | | | | 349,302 | 70,398 | 419,700 |
| Lycoming | 5,374 | | | | | 5,374 |
| Mercer | | 1,008 | | | | 1,008 |
| Mifflin | 29,389 | | | 24,366 | | 53,699 |
| Montgomery | | | | 94,387 | | 94,387 |
| Montour | 33,890 | | | | | 33,890 |
| Northampton | | | | 121,794 | 732 | 122,526 |
| Northumberland | 4,164 | | | 1,978 | | 6,142 |
| Perry | 26,650 | | | 12,734 | | 39,384 |
| Snyder | 31,426 | | | | | 31,426 |
| Tioga | 100 | | | | | 100 |
| Union | 663 | | | 146 | | 809 |
| York | | | 14,712 | 28,165 | 27,604 | 70,058 |
| The state | 283,840 | 197,374 | 15,832 | 1,130,696 | 557,924 | 2,185,675 |
| TENNESSEE. | | | | | | |
| Blount | | | | 2,342 | | 2,342 |
| Bradley | 9,931 | | | | | 9,931 |
| Carter | | | | 4,445 | | 4,445 |
| Dickson | | | | 10,773 | | 10,773 |
| Hamblen | | | | 5,600 | | 5,600 |
| James | 13,235 | | | | | 13,235 |
| Johnson | | | | 3,060 | | 3,060 |
| Lawrence | | | | 641 | | 641 |
| Meigs | 10,206 | | | | | 10,206 |
| Rhea | 13,608 | | | | | 13,608 |
| Roane | 29,581 | | | | | 29,581 |
| Stewart | | | | 1,043 | | 1,043 |
| The state | 76,561 | | | 27,904 | | 104,465 |

TABLE 8.—*Iron ore mined in the census year, by states and counties and by kinds*—Continued.

| State and county. | Fossil. | Carbonate of the Coal Measures and derivatives. | Hematite. | Limonite. | Magnetite. | Total. |
|---|---|---|---|---|---|---|
| | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* |
| TEXAS. | | | | | | |
| Marion | | | | 3,600 | | 3,600 |
| VERMONT. | | | | | | |
| Franklin | | | 560 | | | 560 |
| VIRGINIA. | | | | | | |
| Albemarle | | | | 53 | | 53 |
| Alleghany | | | | 61,106 | | 61,106 |
| Amherst | | | 10,080 | 560 | | 10,640 |
| Augusta | | | | 16,762 | | 16,762 |
| Bedford | | | | 500 | | 500 |
| Botetourt | | | 28,000 | 225 | | 28,225 |
| Campbell | | | | 224 | 84 | 308 |
| Louisa | | | | 14 | | 14 |
| Nelson | | | 3,360 | | | 3,360 |
| Pittsylvania | | | | | 11,726 | 11,726 |
| Rockingham | | | | 31,360 | | 31,360 |
| Shenandoah | | | | 7,856 | | 7,856 |
| Wythe | | | | 10,416 | | 10,416 |
| The state | | | 41,440 | 129,076 | 11,810 | 182,326 |
| WEST VIRGINIA. | | | | | | |
| Braxton | | 2,500 | | | | 2,500 |
| Hampshire | 7,000 | | | | | 7,000 |
| Hardy | | | | 448 | | 448 |
| Kanawha | | 845 | | | | 845 |
| Morgan | | | | 2,800 | | 2,800 |
| Preston | | 33,825 | | | | 33,825 |
| Taylor | | 13,798 | | | | 13,798 |
| The state | 7,000 | 50,968 | | 3,248 | | 61,216 |
| WISCONSIN. | | | | | | |
| Dodge | 39,200 | | | | | 39,200 |
| Sauk | | | | 2,240 | | 2,240 |
| The state | 39,200 | | | 2,240 | | 41,440 |
| The United States | 615,494 | 922,288 | 1,897,778 | 2,148,857 | 2,390,389 | 7,974,806 |

TABLE 9.—*Iron ore mined in the census year (a) by kinds of ore and its per cent. of metallic iron, and (b) by kinds of ore and the amount of its contained iron.*

[Compare with Plate XXII.]

MAGNETITE.

| | Tons of ore. | | Tons of iron. |
|---|---|---|---|
| Under 45 per cent., say 43 per cent | 336,867 | × 43 per cent. = | 144,853 |
| 45 to 60 per cent., say 53 per cent | 1,239,770 | × 53 per cent. = | 657,078 |
| Over 60 per cent., say 63 per cent | 813,752 | × 63 per cent. = | 512,663 |
| Total | 2,390,389 | | 1,314,594 |

LIMONITE.

| | | | |
|---|---|---|---|
| Under 40 per cent., say 38 per cent | 393,551 | × 38 per cent. = | 149,549 |
| 40 to 50 per cent., say 45 per cent | 1,082,344 | × 45 per cent. = | 487,055 |
| Over 50 per cent., say 53 per cent | 672,962 | × 53 per cent. = | 356,670 |
| Total | 2,148,857 | | 993,274 |

HEMATITE.

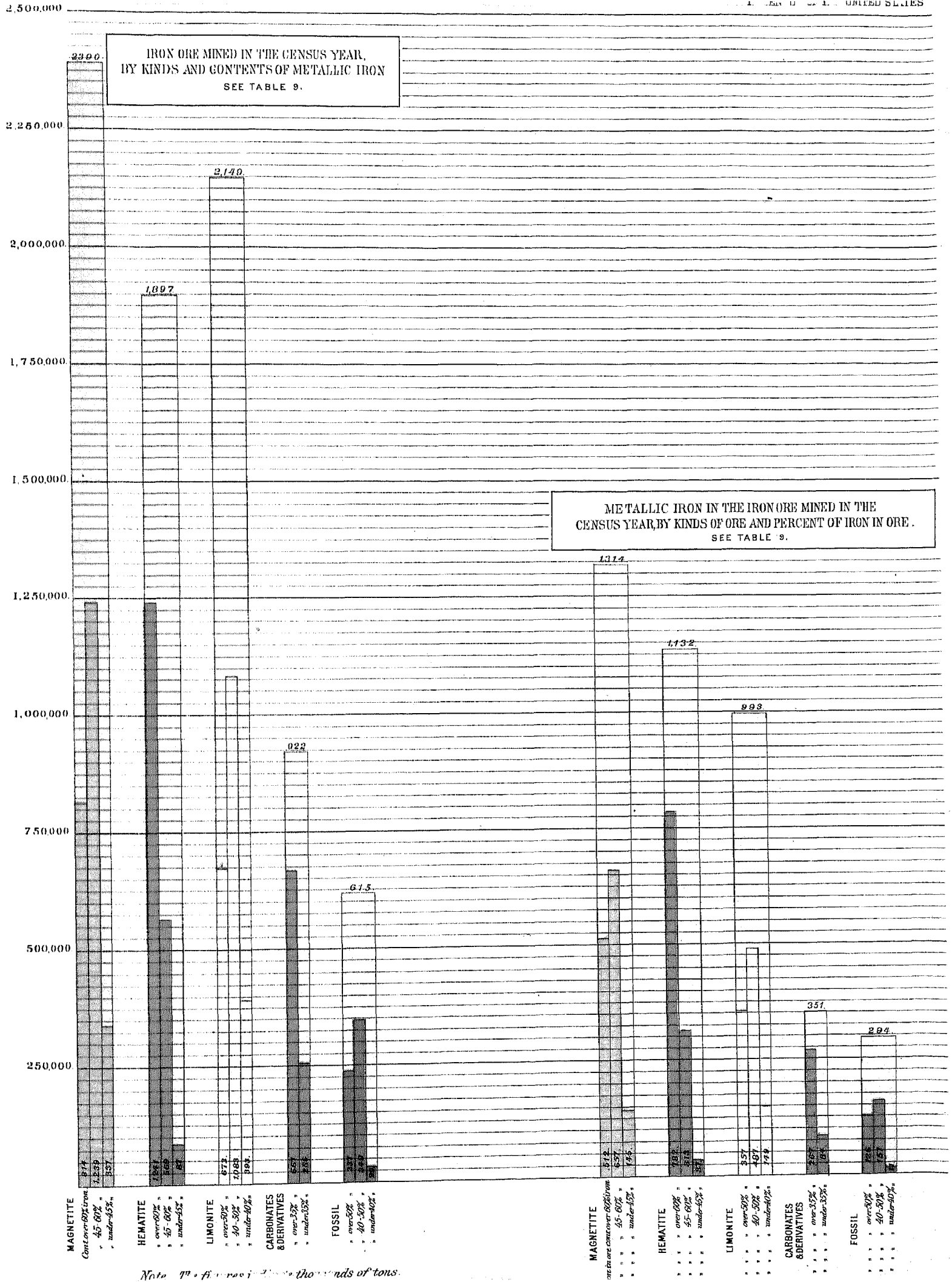
| | | | |
|---|---|---|---|
| Under 45 per cent., say 43 per cent | 86,937 | × 43 per cent. = | 37,383 |
| 45 to 60 per cent., say 55 per cent | 569,364 | × 55 per cent. = | 313,150 |
| Over 60 per cent., say 63 per cent | 1,241,477 | × 63 per cent. = | 782,130 |
| Total | 1,897,778 | | 1,132,663 |

CARBONATE AND DERIVATIVES.

| | | | |
|---|---|---|---|
| Under 35 per cent., say 33 per cent | 254,777 | × 33 per cent. = | 84,076 |
| Over 35 per cent., say 40 per cent | 667,511 | × 40 per cent. = | 267,004 |
| Total | 922,288 | | 351,080 |

## IRON ORE MINED IN THE CENSUS YEAR, BY KINDS AND CONTENTS OF METALLIC IRON

SEE TABLE 9.




## METALLIC IRON IN THE IRON ORE MINED IN THE CENSUS YEAR, BY KINDS OF ORE AND PERCENT OF IRON IN ORE.

SEE TABLE 9.

Note. The figures are thousands of tons.

TABLE 9.—*Iron ore mined in the census year (a) by kinds of ore and its per cent. of metallic iron, and (b) by kinds of ore and the amount of its contained iron*—Continued.

FOSSIL.

| | | | |
|---|---|---|---|
| Under 40 per cent., say 38 per cent | 29,121 × 38 per cent. = | | 11,066 |
| 40 to 50 per cent., say 45 per cent | 349,203 × 45 per cent. = | | 157,144 |
| Over 50 per cent., say 53 per cent | 237,165 × 53 per cent. = | | 125,697 |
| Total | 615,494 | | 293,907 |
| Grand total | 7,974,806 | | 4,085,518 |

This gives an average per cent. of metallic iron in all the ore mined in the census year equal to 51.22. **b**

In Mr. Swank's report on the statistics of the iron and steel production of the United States it is stated that there were produced from blast-furnaces 3,781,021 tons of pig-iron and castings from 7,256,684 tons of ore, which would show an average yield of the ore of 52.13 per cent. of iron.

PLATE XXII AND TABLE 9.

From the columns on the left half of this plate we learn that of the three grades of magnetite the largest product was of ore of the middle grade, containing 45 to 60 per cent. iron, and next in the highest grade; but there were mined over 336,867 tons of magnetite containing less than 45 per cent. of iron.

On the other hand, among the hematites the larger product was in the highest grade, over 60 per cent. iron, and within 2,000 tons of the largest magnetite tonnage, which was, as above stated, in the middle grade, 45 to 60 per cent. iron, while only a small amount (87,000 tons) of hematite was mined of the lowest grade, viz, under **c** 45 per cent. of iron. The reason for this difference between the low-grade magnetite and low-grade hematite doubtless lies largely in the fact that the latter are more silicious and refractory than the former.

Again, in the limonite column, we find in its middle grade (40 to 50 per cent. iron) the largest tonnage, and a much larger product of its low grade (under 40 per cent. iron) than that of the lowest grade hematite. The advantage thus possessed by the lower grades of the hydrated ores is doubtless due in part to the fact that part of their impurity is water, which is much more cheaply got rid of than silica, and in part to the fact that their impurity being largely of aluminous constituents, they work to advantage with silicious ore.

The columns on the right hand show the relative amounts of metallic iron in tons contributed to the metallic-iron product of the United States in the census year by the different varieties of ore.

These amounts are obtained by multiplying tonnage by the percentage of metallic iron, as determined by our **d** own analysis of the commercial and differential samples taken by our own experts.

From these columns it appears that while the largest amount of iron was contributed by the three grades of magnetite, the largest amount contributed among all the varieties by any one grade came from the richest hematite, carrying over 60 per cent. iron.

A comparison of these columns with those of plate XII will show very strikingly the overwhelming importance of the older formations as contributors, nearly six-sevenths of the metallic iron having come from the Archæan and Siluro-Cambrian deposits, while three-fifths came from the Archæan alone.

A similar comparison, when made for the production of 1890, will probably show that the dominant contributor will be the hematite of the Huronian, and that the "fossil" ores will contribute more than the carbonates.

**e**

TABLE 10.—*Iron ore mined in the census year, by its per cent. of metallic iron, by kinds, and by states.*

[NOTE.—The figures in bold-faced type indicate tons of ore from mines from which no samples have been analyzed. The classification in such cases was based on the general character of the ore of the region. The amount of this estimated product is in each case *included* in the amount indicated by the common-faced figures that stand directly under the bold-faced ones. For instance, Alabama is credited with 5,762 tons of carbonate ore containing less than 35 per cent. of metallic iron. The mines that produced 4,082 (5,762-1,680) tons of this were sampled, and the classification of their product is based upon the analyses of the samples. No samples were taken, however, from the mines from which 1,680 tons of ore was raised, and the classification of this portion of the product is based simply on the known general character of similar ore from the region. Again, although many samples of the carbonate ores of Ohio and Maryland, were analyzed, as these ores are mined from small openings along almost continuous outcrops, it was not practicable to identify the analyses with definite amounts of ore mined in the census year. The classification of such ores was based upon their general character as shown by the analyses. Of the total product of 7,974,806 tons, 5,629,003 tons are classified from analyses of ore from producing mines, and 2,345,803 tons are classified from the general character of similar known ore.]

| States. | MAGNETITE. | | | LIMONITE. | | | HEMATITE. | | | CARBONATE. | | FOSSIL. | | | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Under 45 per cent. | 45 to 60 per cent. | Over 60 per cent. | Under 40 per cent. | 40 to 50 per cent. | Over 50 per cent. | Under 45 per cent. | 45 to 60 per cent. | Over 60 per cent. | Under 35 per cent. | Over 35 per cent. | Under 40 per cent. | 40 to 50 per cent. | Over 50 per cent. | |
| | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* |
| Alabama | | | | | 28,293 | 82,403 | | | | **1,680** / 5,762 | | | **227** / 12,912 | 62,306 | 191,676 |
| Connecticut | | | | | 34,878 | 140 | | | | | | | | | 35,018 |
| Delaware | | | | 2,054 | 672 | | | | | | | | | | 2,726 |
| Georgia | | | | | **15,000** / 18,584 | 3,840 / 25,026 | | | | | | | | **47,206** / 47,206 | 91,416 |
| Indiana | | | | | **513** / 513 | | | | | | | | | | 513 |
| Kentucky | | | | | 17,000 | | | | | **2,088** / 6,624 | 2,090 / 40,525 | | | | 64,809 |
| Maine | | | | | 6,000 | | | | | | | | | | 6,000 |
| Maryland | | | 218 | | **64,760** / 64,760 | | | | | | **73,632** / 73,632 | | 1,018 | | 139,628 |

TABLE 10.—*Iron ore mined in the census year, by its per cent. of metallic iron, by kinds, and by states*—Continued.

| States. | MAGNETITE. | | | LIMONITE. | | | HEMATITE. | | | CARBONATE. | | FOSSIL. | | | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Under 45 per cent. | 45 to 60 per cent. | Over 60 per cent. | Under 40 per cent. | 40 to 50 per cent. | Over 50 per cent. | Under 45 per cent. | 45 to 60 per cent. | Over 60 per cent. | Under 35 per cent. | Over 35 per cent. | Under 40 per cent. | 40 to 50 per cent. | Over 50 per cent. | |
| | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* |
| Massachusetts | ..... | ..... | ..... | ..... | 5,600<br>62,637 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 62,637 |
| Michigan | ..... | ..... | 148,719 | ..... | 14,157 | 60,425<br>315,740 | ..... | 7,701<br>360,283 | 33,600<br>998,813 | ..... | ..... | ..... | ..... | ..... | 1,837,712 |
| Missouri | ..... | ..... | ..... | ..... | 112<br>112 | ..... | ..... | 143,981 | 242,104 | ..... | ..... | ..... | ..... | ..... | 386,197 |
| New Jersey | 78,400 | 41,512<br>517,201 | 146,263 | ..... | 5,637<br>15,508 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 757,372 |
| New York | 130,425 | 26,274<br>200,047 | 506,580 | 14,149 | 1,824<br>140,719 | ..... | 55,577 | 255<br>39,188 | ..... | ..... | ..... | 280 | 85,162 | ..... | 1,262,127 |
| North Carolina | 100 | 290<br>2,022 | 680 | ..... | ..... | 404<br>516 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3,318 |
| Ohio | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 107,276<br>107,276 | 440,127<br>440,127 | ..... | ..... | ..... | 547,403 |
| Oregon | ..... | ..... | ..... | ..... | 6,972 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 6,972 |
| Pennsylvania | 127,942 | 127,309<br>429,982 | ..... | 303,732<br>374,640 | 541,513<br>552,473 | 158,395<br>203,574 | .....<br>..... | 15,832<br>15,832 | ..... | 94,325<br>109,631 | 74,456<br>87,743 | 22,338<br>28,841 | 173,072<br>225,838 | 10,121<br>29,170 | 2,185,675 |
| Tennessee | ..... | ..... | ..... | 1,130 | 11,893 | 2,458<br>14,881 | ..... | ..... | ..... | ..... | ..... | ..... | 5,684<br>17,278 | 5,684<br>59,283 | 104,465 |
| Texas | ..... | ..... | ..... | ..... | 3,600<br>3,600 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3,600 |
| Vermont | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 560<br>560 | ..... | ..... | ..... | ..... | ..... | 560 |
| Virginia | ..... | 518<br>518 | 11,292 | 1,569 | 97,425 | 30,082 | 31,360 | 10,080 | ..... | ..... | ..... | ..... | ..... | ..... | 182,326 |
| West Virginia | ..... | ..... | ..... | ..... | 3,248<br>3,248 | ..... | ..... | ..... | ..... | 25,484<br>25,484 | 25,484<br>25,484 | ..... | 7,000<br>7,000 | ..... | 61,216 |
| Wisconsin | ..... | ..... | ..... | ..... | 2,240<br>2,240 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 39,200 | 41,440 |
| The United States | 336,867 | 195,908<br>1,299,770 | 813,752 | 303,732<br>393,551 | 444,045<br>1,082,344 | 225,511<br>672,962 | 86,937 | 23,788<br>569,364 | 33,760<br>1,241,477 | 230,853<br>254,777 | 615,789<br>667,511 | 22,338<br>29,121 | 186,583<br>349,208 | 63,011<br>237,165 | 2,345,803<br>7,974,806 |

TABLE 10 *a*.—*Metallic iron in the ore mined in the census year, by states, kinds of ore and its per cent. in metallic iron.*

| State. | METALLIC IRON IN MAGNETITE. | | | METALLIC IRON IN LIMONITE. | | | METALLIC IRON IN HEMATITE. | | | METALLIC IRON IN CARBONATE. | | METALLIC IRON IN FOSSIL ORE. | | | Total. | Per cent. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | In ore containing under 45 per cent. iron, say 43 per cent. | In ore containing from 45 to 60 per cent. iron, say 53 per cent. | In ore containing over 60 per cent. iron, say 63 per cent. | In ore containing under 40 per cent. iron, say 38 per cent. | In ore containing from 40 to 50 per cent. iron, say 45 per cent. | In ore containing over 50 per cent. iron, say 53 per cent. | In ore containing under 45 per cent. iron, say 43 per cent. | In ore containing from 45 to 60 per cent. iron, say 55 per cent. | In ore containing over 60 per cent. iron, say 63 per cent. | In ore containing under 35 per cent. iron, say 33 per cent. | In ore containing over 35 per cent. iron, say 40 per cent. | In ore containing under 40 per cent. iron, say 38 per cent. | In ore containing from 40 to 50 per cent. iron, say 45 per cent. | In ore containing over 50 per cent. iron, say 53 per cent. | | |
| | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | |
| Alabama | ..... | ..... | ..... | ..... | 12,732 | 43,674 | ..... | ..... | ..... | 1,901 | ..... | ..... | 5,810 | 33,022 | 97,139 | 2.378 |
| Connecticut | ..... | ..... | ..... | ..... | 15,695 | 74 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 15,769 | 0.388 |
| Delaware | ..... | ..... | ..... | 780 | 302 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,082 | 0.027 |
| Georgia | ..... | ..... | ..... | ..... | 8,363 | 13,582 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 25,019 | 46,964 | 1.149 |
| Indiana | ..... | ..... | ..... | ..... | 231 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 231 | 0.005 |
| Kentucky | ..... | ..... | ..... | ..... | 7,947 | ..... | ..... | ..... | ..... | 2,186 | 16,210 | ..... | ..... | ..... | 26,343 | 0.645 |
| Maine | ..... | ..... | ..... | ..... | 2,700 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2,700 | 0.066 |
| Maryland | ..... | ..... | 137 | ..... | 20,142 | ..... | ..... | ..... | ..... | ..... | 29,453 | ..... | 458 | ..... | 50,190 | 1.449 |
| Massachusetts | ..... | ..... | ..... | ..... | 28,187 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 28,187 | 0.690 |
| Michigan | ..... | ..... | 98,693 | ..... | 6,371 | 167,342 | ..... | 198,156 | 629,252 | ..... | ..... | ..... | ..... | ..... | 1,004,814 | 26.797 |
| Missouri | ..... | ..... | ..... | ..... | 50 | ..... | ..... | 79,190 | 152,526 | ..... | ..... | ..... | ..... | ..... | 231,766 | 5.674 |
| New Jersey | 33,712 | 274,116 | 92,146 | ..... | 6,979 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 406,953 | 9.960 |
| New York | 56,083 | 153,725 | 319,145 | 5,377 | 63,324 | ..... | 23,898 | 21,553 | ..... | ..... | ..... | 106 | 38,323 | ..... | 681,534 | 16.681 |
| North Carolina | 45 | 1,072 | 428 | ..... | ..... | 273 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,818 | 0.044 |
| Ohio | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 35,401 | 176,051 | ..... | ..... | ..... | 211,452 | 5.178 |
| Oregon | ..... | ..... | ..... | ..... | 3,137 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3,137 | 0.077 |
| Pennsylvania | 55,015 | 227,890 | ..... | 142,367 | 248,613 | 107,894 | ..... | 8,707 | ..... | 36,178 | 35,097 | 10,960 | 101,628 | 15,460 | 989,809 | 24.227 |
| Tennessee | ..... | ..... | ..... | 420 | 5,352 | 7,887 | ..... | ..... | ..... | ..... | ..... | ..... | 7,775 | 31,420 | 52,863 | 1.294 |
| Texas | ..... | ..... | ..... | ..... | 1,620 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,620 | 0.040 |
| Vermont | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 352 | ..... | ..... | ..... | ..... | ..... | 352 | 0.009 |
| Virginia | ..... | 275 | 7,114 | 596 | 46,841 | 15,944 | 13,485 | 5,544 | ..... | ..... | ..... | ..... | ..... | ..... | 89,799 | 2.125 |
| West Virginia | ..... | ..... | ..... | ..... | 1,461 | ..... | ..... | ..... | ..... | 8,410 | 10,193 | ..... | 3,150 | ..... | 23,214 | 0.568 |
| Wisconsin | ..... | ..... | ..... | ..... | 1,008 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 20,776 | 21,784 | 0.533 |
| The United States | 144,853 | 657,078 | 512,663 | 149,549 | 487,055 | 356,670 | 37,383 | 313,150 | 782,130 | 84,076 | 267,004 | 11,066 | 157,144 | 125,697 | 4,085,518 | ..... |
| Per cent | 3.545 | 16.083 | 12.548 | 3.661 | 11.921 | 8.731 | 0.915 | 7.666 | 19.148 | 2.058 | 6.536 | 0.271 | 3.846 | 3.076 | ..... | 100.000 |

TABLES 10 AND 10*a* AND PLATE XIII. a

Tables 10 and 10*a* show for each state the kinds and the grades of the ores mined, and the number of tons of metallic iron contributed by each grade.

The varied resources of Pennsylvania are shown by the fact that each of the five great varieties—magnetite, hematite, limonite, carbonate, and fossil ore—contributed to her product. While we see from plate XIII that the limonite furnished the largest amount of ore, and the magnetite the next largest, we see from table 10*a* that the largest contribution of metallic iron was from the middle grade of limonite, carrying from 40 to 50 per cent. iron; and the next largest amount was from the middle grade of magnetite, containing 45 to 60 per cent. iron. Only the middle grade of hematite is represented, and while the two grades of carbonate and derivatives contributed almost b equal amounts, the middle grade of fossil ore—40 to 50 per cent. iron—furnished nearly four times as much iron as the highest and lowest grades combined.

In New Jersey it is the middle grade—45 to 60 per cent.—magnetites that furnishes the greater amount of iron, while in New York, whose center of production is much more distant from market, the magnetite of the highest grade ranks first as an iron producer.

Looking at the fossil ores, we find that while in Pennsylvania, New York, and West Virginia the middle grade—40 to 50 per cent. iron—is the largest contributor (New York furnished no fossil ore of the highest grade, and Pennsylvania only a small fraction), in the States of Alabama, Georgia, Tennessee, and Wisconsin the production was almost confined to the highest grade—over 50 per cent. iron.

Looking at the carbonates, we find that of the whole amount of iron from this source three-fourths came from c the higher grade—over 35 per cent. iron.

In the hematites only New York and Virginia produced ores averaging below 45 per cent. iron, and only Michigan and Missouri mined hematites averaging above 60 per cent.

TABLE 11.—*A partial classification of the iron ore mined in the census year, by phosphorus ratios, by kinds, and by states.*

| States. | MAGNETITE. | | | | | LIMONITE. | | | | | HEMATITE. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus ratio.... | Under .05 | .05–.10 | .10–.50 | .50–1.00 | Over 1.00 | Under .05 | .05–.10 | .10–.50 | .50–1.00 | Over 1.00 | Under .05 | .05–.10 | .10–.50 | .50–1.00 | Over 1.00 |
| | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* |
| Alabama | | | | | | | | 57, 807 | 24, 358 | 28, 471 | | | | | |
| Connecticut | | | | | | | | 34, 878 | | 140 | | | | | |
| Delaware | | | | | | | | 672 | 2, 054 | | | | | | |
| Georgia | | | | | | | | | 7, 504 | 17, 857 | | | | | |
| Indiana | | | | | | | | | | | | | | | |
| Kentucky | | | | | | | | 17, 660 | | | | | | | |
| Maine | | | | | | 6, 000 | | | | | | | | | |
| Maryland | | | 218 | | | | | 26, 789 | 17, 843 | 17, 133 | | | | | |
| Massachusetts | | | | | | | | 55, 389 | 1, 368 | 280 | | | | | |
| Michigan | | 47, 309 | 99, 419 | | | | 80, 055 | 189, 417 | | | 187, 896 | 633, 338 | 488, 481 | 8, 080 | |
| Missouri | | | | | | | | | | | 11, 146 | 276, 834 | 88, 562 | | |
| New Jersey | 11, 087 | 103, 754 | 176, 763 | 176, 200 | 232, 548 | | | | 9, 871 | | | | | | |
| New York | 184, 649 | 151, 307 | 40, 557 | 102, 824 | 421, 381 | | 24, 805 | 82, 556 | 41, 552 | 4, 131 | | | 70, 586 | 8, 534 | 15, 390 |
| North Carolina | 2, 400 | 350 | | | | 112 | | | | | | | | | |
| Ohio | | | | | | | | | | | | | | | |
| Oregon | | | | | | | | | | 6, 972 | | | | | |
| Pennsylvania | 300, 213 | 88, 935 | 60, 598 | | | 3, 290 | 55, 936 | 85, 953 | 72, 093 | 97, 355 | | | | | |
| Tennessee | | | | | | | 5, 600 | 17, 659 | 1, 963 | 224 | | | | | |
| Texas | | | | | | | | | | | | | | | |
| Virginia | | | 11, 202 | | | | 2, 800 | 58, 920 | 29, 924 | 35, 849 | | 2, 360 | 10, 080 | 28, 000 | |
| Vermont | | | | | | | | | | | | | | | |
| West Virginia | | | | | | | | | 448 | | | | | | |
| Wisconsin | | | | | | | | | | | | | | | |
| The United States... | 498, 349 | 391, 706 | 388, 847 | 279, 024 | 653, 929 | 9, 402 | 169, 196 | 627, 760 | 208, 078 | 208, 403 | 199, 042 | 913, 532 | 657, 709 | 44, 614 | 15, 390 |
| Total classified | | | | | 2, 211, 855 | | | | | 1, 223, 739 | | | | | 1, 830, 287 |
| Total unclassified | | | | | 178, 534 | | | | | 925, 678 | | | | | 66, 931 |
| Total product | | | | | 2, 390, 389 | | | | | 2, 149, 417 | | | | | 1, 897, 218 |

a TABLE 11.—*A partial classification of the iron ore mined in the census year, by phosphorus ratios, &c.*—Continued.

| States. | COAL-MEASURE AND MESOZOIC CARBONATES AND DERIVATIVES. | | | | | FOSSIL. | | | | | Total ore, classified. | Total ore, unclassified. | Total product. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Phosphorus ratio..... | Under .05 | .05–.10 | .10–.50 | .50–1.00 | Over 1.00 | Under .05 | .05–.10 | .10–.50 | .50–1.00 | Over 1.00 | | | |
| | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* |
| Alabama..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 41,802 | 33,089 | ..... | 185,687 | 5,989 | 191,676 |
| Connecticut..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 35,018 | ..... | 35,018 |
| Delaware..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2,726 | ..... | 2,726 |
| Georgia..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 25,361 | 66,055 | 91,416 |
| Indiana..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 513 | 513 |
| Kentucky..... | ..... | ..... | 9,381 | 6,036 | 1,500 | ..... | ..... | ..... | ..... | ..... | 34,577 | 30,232 | 64,809 |
| Maine..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 6,000 | ..... | 6,000 |
| Maryland..... | ..... | ..... | 73,368 | ..... | ..... | ..... | ..... | 1,018 | ..... | ..... | 136,360 | 3,259 | 139,628 |
| Massachusetts..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 57,037 | 5,600 | 62,637 |
| Michigan..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,733,986 | 103,726 | 1,837,712 |
| Missouri..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 376,542 | 9,655 | 386,197 |
| New Jersey..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 710,223 | 47,149 | 757,372 |
| New York..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 85,442 | 1,233,774 | 28,353 | 1,262,127 |
| North Carolina..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2,862 | 450 | 3,318 |
| Ohio..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 547,403 | 547,403 |
| Oregon..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 6,972 | ..... | 6,972 |
| Pennsylvania..... | ..... | ..... | 12,287 | 15,306 | ..... | ..... | ..... | 14,013 | 54,142 | 41,361 | 901,482 | 1,284,193 | 2,185,675 |
| Tennessee..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 23,166 | 28,204 | 13,732 | 90,638 | 13,827 | 104,465 |
| Texas..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3,600 | 3,600 |
| Virginia..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 180,210 | 2,110 | 182,326 |
| Vermont..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 560 | 560 |
| West Virginia..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 7,000 | ..... | ..... | 7,448 | 53,768 | 61,216 |
| Wisconsin..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 39,200 | 39,200 | 2,240 | 41,440 |
| The United States... | ..... | ..... | 95,036 | 21,342 | 1,500 | ..... | ..... | 86,499 | 116,125 | 179,735 | ..... | ..... | ..... |
| Total classified..... | ..... | ..... | ..... | ..... | 117,878 | ..... | ..... | ..... | ..... | 382,359 | ..... | ..... | ..... |
| Total unclassified... | ..... | ..... | ..... | ..... | 804,410 | ..... | ..... | ..... | ..... | 233,135 | ..... | ..... | ..... |
| Total product..... | ..... | ..... | ..... | ..... | 922,288 | ..... | ..... | ..... | ..... | *615,494* | *5,760,118* | *2,209,688* | 7,974,806 |

d

TABLE 11.

This table deals only with a part of the product of the country—something less than three-quarters, and with more than five-sixths of the ore from the Bessemer producing varieties—magnetite, hematite, and limonite.

In view of the tendency of the metallurgical requirements of the near future, the columns showing tonnage with a phosphorus ratio of under .05 and of over 1.00 become equally interested with the acid-Bessemer columns proper, namely, under .05 and .05 to .10.

An interesting fact is, that while the magnetites produced only about four-fifths as much Bessemer ore as the hematites, more than half of the magnetite contribution of Bessemer ore had the extremely low phosphorus ratio of under .05; and the magnetite tonnage with this low ratio was more than double that of the hematite, with a e similarly low ratio.

TABLE 12.—*Bessemer ore mined in the census year, by kinds and by states.*

[Compare with plates XXIII and XXIV.]

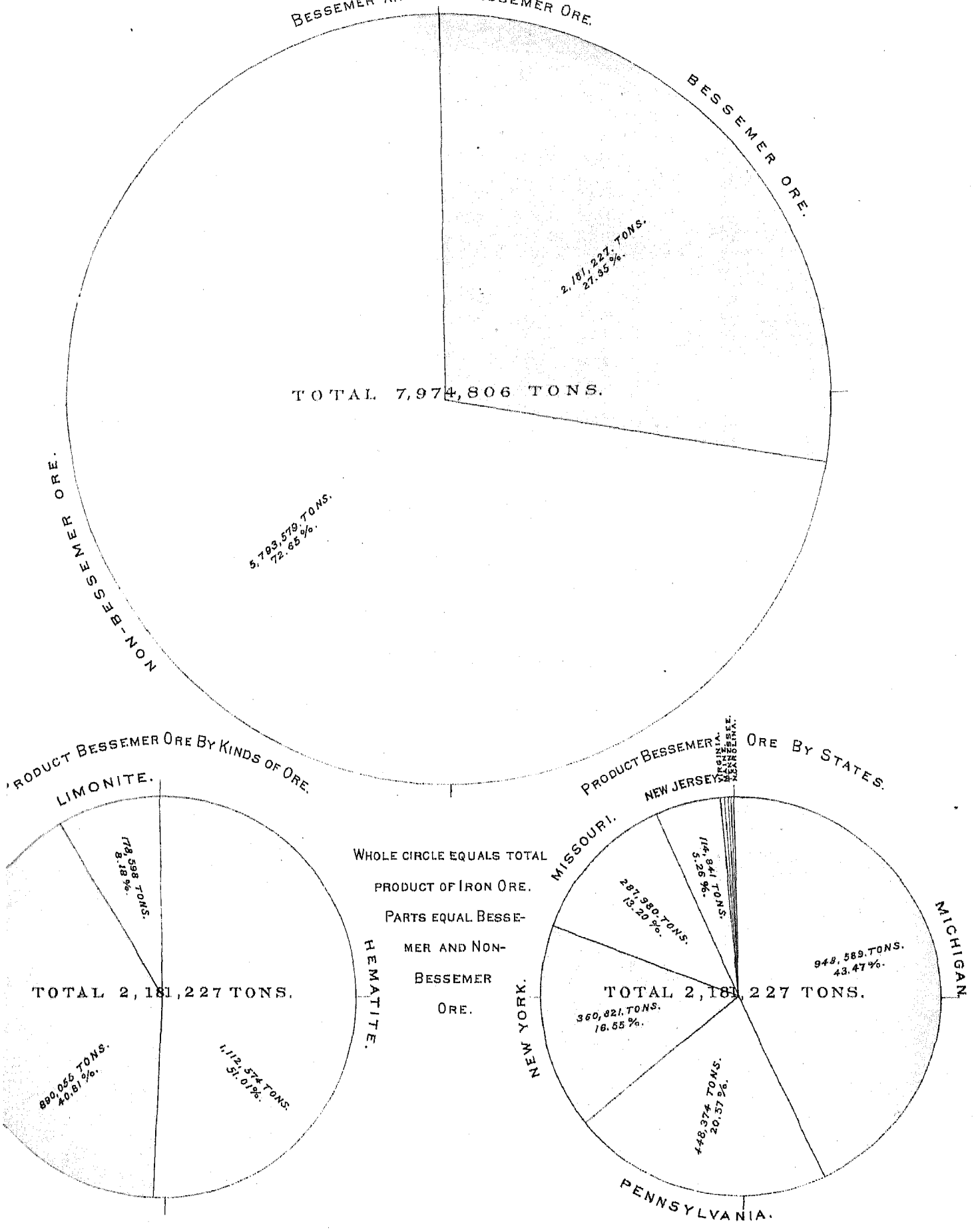
[NOTE.—In this table is included only such ore that if smelted alone would produce pig containing not more than one-tenth of one per cent. of phosphorus. It is to be noted, however, that ore with a higher phosphorus-iron ratio than 0.10 is used in mixture in the manufacture of Bessemer pig.]

| States. | Magnetite. | Hematite. | Limonite. | Total. | Per cent. |
|---|---|---|---|---|---|
| | *Tons.* | *Tons.* | *Tons.* | *Tons.* | |
| Maine..... | ..... | ..... | 6,000 | 6,000 | .28 |
| Michigan..... | 47,800 | 821,234 | *a*80,055 | 948,589 | 43.47 |
| Missouri..... | ..... | *b*287,080 | ..... | 287,080 | 13.20 |
| New Jersey..... | 114,841 | ..... | ..... | 114,841 | 5.26 |
| New York..... | 336,016 | ..... | 24,805 | 360,821 | 16.55 |
| North Carolina..... | 2,750 | ..... | 112 | 2,862 | .13 |
| Pennsylvania..... | 389,148 | ..... | *c*59,226 | 448,374 | 20.56 |
| Tennessee..... | ..... | ..... | 5,600 | 5,600 | .26 |
| Virginia..... | ..... | 3,360 | 2,800 | 6,160 | .28 |
| Total..... | 890,055 | 1,112,574 | 178,598 | 2,181,227 | ..... |
| Per cent..... | 40.81 | 51.01 | 8.18 | 100.00 | 100.00 |

*a* See note under table 7. (Production of ore by states and kinds.)

*b* In making up the total Bessemer-ore product of Missouri, it was assumed that all but 500 tons of the ore mined at Iron Mountain in the census year was sufficiently low in phosphorus to come into this class.

*c* This is a rough estimate only. It is probably below the truth, even for ore with a phosphorus ratio less than 0.10 per cent. As a matter of fact, the tota product of the Bloomfield and Springfield mines in Blair county (107,222 tons) is reported as having been used, mixed with magnetite ore, to make Bessemer pig, while only that from the Springfield mines (53,739 tons) is shown by analysis to have a phosphorus ratio less than 0.10 per cent., and is included in this table.




WHOLE CIRCLE EQUALS TOTAL PRODUCT BESSEMER ORE.

PARTS EQUAL THIS PRODUCT BY KINDS OF ORE.

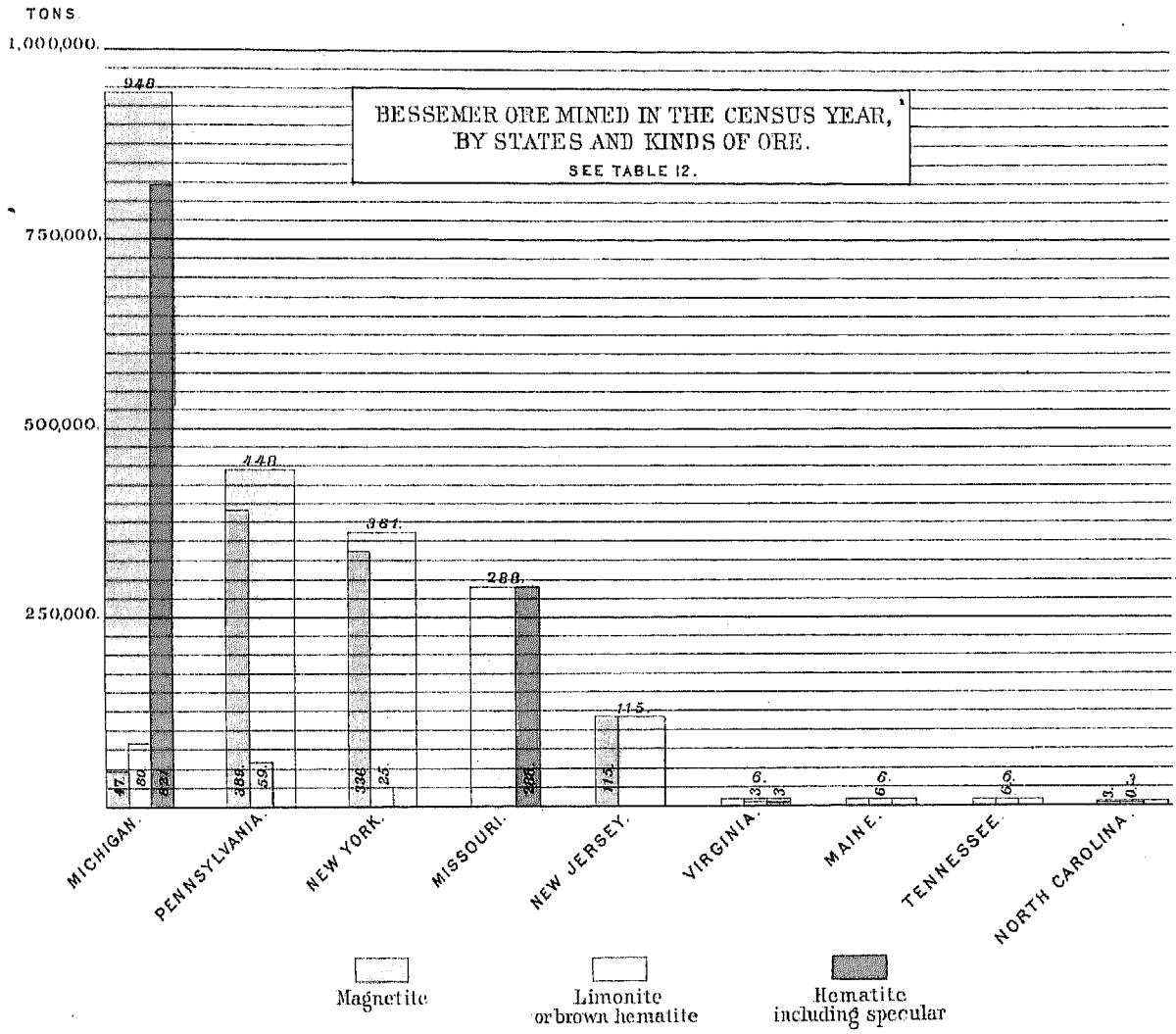
WHOLE CIRCLE EQUALS TOTAL PRODUCT BESSEMER ORE.

PARTS EQUAL THIS PRODUCT BY STATES.

# BESSEMER ORE PRODUCT IN THE CENSUS YEAR

Julius Bien & Co Lith.

*See Table 12*




*Note. The figures indicate thousands of tons. 0 is used where less than 500 tons were produced.*

Julius Bien & Co. Lith.

TABLES 11 AND 12 AND PLATES XXIII AND XXIV. a

Among the most important tabulations are the tables and plates presenting the production of Bessemer ore, or ore having a phosphorus-iron ratio not exceeding 0.10. The total Bessemer product—2,181,227 tons—formed 27.35 per cent. of the total ore product of the United States.

Nine states produced more or less, although four of these furnished each less than one-third of one per cent. of the whole.

Their order as to amount of Bessemer ore mined is shown on the table on page 19. Michigan ranks first, producing 43 per cent. of the national product, and more than twice as much as the next largest state, Pennsylvania, which furnished 20½ per cent.; while New York followed third with 16½ per cent., and Missouri fourth with 13⅕ b per cent., and New Jersey fifth with 5¼ per cent.

From table 12 and plate XXIII we see that only three of the great varieties—magnetite, hematite, and limonite—contributed ore with a sufficiently low phosphorus ratio, to be applicable without mixture to the manufacture of Bessemer steel. Of the total tonnage of 2,181,227 tons, the different varieties gave—

| Ores. | Tons. | Per cent. |
|---|---|---|
| Magnetite | 890,055 | 40.81 |
| Hematite | 1,112,574 | 51.01 |
| Limonite | 178,598 | 8.18 |
| Total | 2,181,227 | 100.00 |

Referring these ores to their geological sources we find that the Huronian is by far the largest contributor, the Laurentian coming next, and the Siluro-Cambrian third, a large part of the Bessemer of the latter formation being the magnetites of the Cornwall and other mines, which are assigned by Lesley to that horizon as altered limonites.

The actual geological distribution of the Bessemer product is as follows:

| Ores. | Tons. | Per cent. |
|---|---|---|
| Laurentian | 482,611 | 22.13 |
| Huronian | 1,242,841 | 56.98 |
| Siluro-Cambrian | 449,775 | 20.62 |
| Cenozoic | 6,000 | 0.27 |
| Total | 2,181,227 | 100.00 |

The southern states produced all together only 14,622 tons, or less than $\frac{67}{100}$ of 1 per cent. This may be materially changed by future development of ore-bodies in the Archæan regions of North and South Carolina and Georgia.

There were produced of ores with a phosphorus ratio of under .05—

| Ores. | Tons. |
|---|---|
| Magnetite | 498,340 |
| Hematite | 199,042 |
| Limonite | 9,402 |
| Total | 706,793 |

or nearly one-eleventh of the total ore product of the country.

Out of the 5,766,118 tons of ore designated in table 11, as "classified" by our chemical analyses, there were of ores carrying more than 1 per cent. of phosphorus—

| Ores. | Tons. | Per cent. of the classified ore of this variety. |
|---|---|---|
| Magnetite | 653,029 | 27.56 |
| Hematite | 15,390 | 0.84 |
| Limonite | 208,493 | 17.02 |
| Carbonate | 1,500 | 1.27 |
| Fossil | 170,735 | 47.00 |
| Total | 1,058,957 | |

We may assume, probably without appreciable error, that in the unclassified portions of magnetite, hematite, limonite, and fossil ores, the percentages of ores with a phosphorus-iron ratio greater than 1.00 will be the same as they are in the classified portions of those varieties. This assumption cannot be made, however, for the carbonates, as, for reasons elsewhere stated, no attempt was made to classify as regards phosphorus-iron ratio the greater part of the Coal Measure ores. The samples of these ores were taken to represent, not mines, but fields.

a An examination of the tables of analyses shows, however, that of the 93 samples from Ohio, 31, or one-third, gave a phosphorus-iron ratio greater than 1.00. The same fraction represents the proportion of the Alabama and Kentucky carbonate samples carrying this proportion of phosphorus.

It is believed, therefore, that we will not be far from the truth if we estimate one-third of the total carbonate product as having a phophorous-iron ratio greater than 1.00.

We should have, then, in our unclassified ores, the following amounts of ores with a phosphorus-iron ratio greater than 1.00:

b

| Ores. | Tons. |
|---|---|
| Magnetite | 52,775 |
| Hematite | 562 |
| Limonite | 157,550 |
| Carbonate | 305,500 |
| Fossil | 109,573 |
| Total | 625,960 |
| Ore previously classified as above | 1,058,957 |
| Total ore having a phosphorus-iron ratio greater than 1.00. | 1,684,917 |

Although not strictly belonging in this place, I have added a table showing the maximum, minimum, and c average royalty paid in each state for the privilege of mining each kind of ore. Royalty was paid on more than one-quarter of the product of the United States, the average being 43.7 cents per ton of 2,000 pounds.

Mr. I. Lowthian Bell(*a*) states that the usual royalty paid in England to the landowners for hematite and calcined blackband is about 2*s.* 6*d.*, or 62½ cents per ton of 2,240 pounds, though in some instances much more is paid. In the Cleveland district, where the ore is leaner and the amount of ore is practically inexhaustible, it is rated (1884) at 9 per cent. of the selling price of Cleveland pig-iron. Mr. Bell summarizes roughly the royalties for ore and coal, calculated for the ton of pig-iron, in the great European producing centers,(*b*) viz: Cleveland, 81 cents; Scotland, $1 50; Cumberland, $1 56; Germany, 12 cents; France, 16 cents; Belgium, 15 to 50 cents.

TABLE 13.—*Royalties by kinds of ore and by states.*

| State. | Kind of ore. | Number of tons paying royalty. | Maximum royalty. | Minimum royalty. | Average royalty. | Total royalty paid. |
|---|---|---|---|---|---|---|
| Alabama | Limonite | 24,358 | $0.22 | $0.088 | $0.149 | $3,641 09 |
| Do | Fossil | 24,252 | 0.088 | 0.088 | 0.088 | 2,134 17 |
| Connecticut | Limonite | 28,677 | 1.78 | 1.78 | 1.78 | 42,145 06 |
| Kentucky | ...do | 8,605 | 0.176 | 0.176 | 0.175 | 1,514 48 |
| Do | Carbonate | 9,381 | 0.22 | 0.22 | 0.219 | 2,063 82 |
| Maryland | Limonite | 9,296 | 0.63 | 0.223 | 0.416 | 3,886 17 |
| Do | Carbonate | 2,240 | 0.67 | 0.67 | 0.67 | 1,500 80 |
| Massachusetts | Limonite | 3,845 | 0.33 | 0.22 | 0.267 | 1,027 18 |
| Michigan | ...do | 181,165 | 0.76 | 0.36 | 0.445 | 81,751 76 |
| Do | Soft specular | 73,893 | 0.54 | 0.33 | 0.446 | 33,006 77 |
| Do | Specular | 109,792 | 0.45 | 0.31 | 0.391 | 42,838 72 |
| Do | Specular and magnetite. | 27,401 | 0.67 | 0.45 | 0.530 | 14,548 05 |
| Missouri | Hematite | 506 | 0.44 | 0.44 | 0.440 | 222 64 |
| Do | Specular | 140,091 | 0.89 | 0.13 | 0.463 | 64,921 43 |
| New Jersey | Magnetite | 350,674 | 0.89 | 0.22 | 0.546 | 191,506 05 |
| Do | Limonite | 14,271 | 0.49 | 0.22 | 0.433 | 6,185 13 |
| New York | ....do | 43,502 | 0.89 | 0.26 | 0.605 | 28,055 09 |
| Do | Fossil | 45,702 | 0.27 | 0.13 | 0.228 | 10,455 52 |
| Do | Magnetite | 93,251 | 0.89 | 0.13 | 0.347 | 32,414 96 |
| Do | Hematite | 8,960 | 0.22 | 0.22 | 0.22 | 1,971 20 |
| Ohio | Carbonate | 50,269 | 0.22 | 0.089 | 0.179 | 9,003 72 |
| Pennsylvania | Limonite | 646,261 | 1.08 | 0.15 | 0.454 | 293,623 41 |
| Do | Fossil | 102,001 | 0.49 | 0.089 | 0.264 | 27,024 81 |
| Do | Carbonate | 12,287 | 0.13 | 0.13 | 0.13 | 1,597 31 |
| Do | Magnetite | 210,828 | 0.89 | 0.22 | 0.470 | 99,110 42 |
| Do | Specular | 1,486 | 0.55 | 0.45 | 0.478 | 710 90 |
| Tennessee | Limonite | 7,942 | 0.22 | 0.089 | 0.127 | 1,013 64 |
| Do | Fossil | 40,721 | 0.26 | 0.20 | 0.234 | 9,554 94 |
| Virginia | Limonite | 37,520 | 0.22 | 0.09 | 0.216 | 8,123 36 |
| Do | Magnetite | 84 | 0.09 | 0.09 | 0.09 | 7 56 |
| Do | Specular | 13,440 | 0.29 | 0.22 | 0.237 | 3,192 10 |
| West Virginia | Limonite | 3,025 | 0.18 | 0.089 | 0.173 | 524 02 |
| Do | Carbonate | 13,798 | 0.04 | 0.04 | 0.04 | 551 92 |
| Total | | 2,334,524 | | | | 1,020,429 10 |

Equivalent to an average royalty of 43.7 cents per ton of 2,000 pounds, or 48.9 cents per ton of 2,240 pounds.

*a Principles of the Manufacture of Iron and Steel*, p. 602. *b Loc. cit.*, p. 610.

For comparison, I append some statistics since the census year, and also those for Lake Superior, Michigan, a from the beginning of the development of that district:

*Iron ore consumed in the United States.*

| Year. | Domestic, tons of 2,000 pounds. | Imported, tons of 2,000 pounds. |
|---|---|---|
| 1882 | 9,744,000 | *a* 660,412 |
| 1883 | ..... | *b* 549,780 |
| 1884 | 8,556,330 | *b* 545,358 |
| 1885 | ..... | *c* 476,974 |

*a* J. M. Swank, in A. W. Williams' *Mineral Resources of the United States*, 1883, p. 115.
*b Annual Report American Iron and Steel Association for* 1884, p. 40.
*c Bulletin American Iron and Steel Association*, January, 1886.

*The world's production of iron ore.* (*d*)

| Countries. | Year. | Tons of 2,000 pounds. |
|---|---|---|
| Great Britain | 1882 | 18,022,240 |
| United States | 1882 | 10,080,000 |
| Germany | 1882 | 8,081,478 |
| France | 1882 | 3,857,000 |
| Belgium | 1882 | 275,500 |
| Austria and Hungary | 1881 | 1,157,100 |
| Russia | 1880 | 1,128,310 |
| Sweden | 1881 | 910,532 |
| Spain | 1882 | 5,510,000 |
| Italy | 1882 | 385,700 |
| Other countries | 1882 | 1,102,000 |
| Total | ..... | 52,009,869 |

*d* Swank, in *Mineral Resources of the United States*, p. 100.

Mr. I. Lowthian Bell (*a*) gives as below the output of the five greatest iron-ore producing countries for 1870, 1875, 1881, to which I add from J. M. Swank (*b*) some returns for 1882, 1883, 1884:

| Countries. | 1870. | 1875. | 1881. | 1882. | 1883. | 1884. |
|---|---|---|---|---|---|---|
| | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* | *Tons.* |
| United Kingdom | 14,370,000 | 15,821,000 | 17,440,000 | 18,022,240 | 19,469,011 | 18,480,000 |
| United States | 3,210,000 | 4,500,000 | 7,074,000 | 9,744,000 | ..... | 8,556,330 |
| Germany | 3,839,000 | 4,730,000 | 7,573,000 | 9,128,181 | 9,807,411 | ..... |
| France | 2,899,000 | 2,540,000 | 3,500,000 | 3,920,000 | ..... | ..... |
| Belgium | 654,000 | 365,000 | 200,000 | 280,000 | ..... | ..... |
| Spain | ..... | ..... | ..... | ..... | 5,069,432 | ..... |

*Production of Lake Superior mines.* (*a*)

| Calendar year— | Tons of 2,000 pounds. |
|---|---|
| 1880 | 2,226,109 |
| 1881 | 2,599,872 |
| 1882 | 3,301,079 |
| 1883 | 2,634,562 |
| 1884 | 2,820,212 |
| 1885 | 2,718,729 |

*a* Including northern Wisconsin and Minnesota.

The total output of the Lake Superior mines from their opening in 1854 to the end of 1885 was 28,445,813 tons.

*a Principles of the Manufacture of Iron and Steel*, 1884, p. 451. *b Annual Report American Iron and Steel Association*, 1884.

a

*Production of New Jersey mines.*

| Calendar year— | Tons of 2,000 pounds. |
|---|---|
| 1880 | 834,400 |
| 1881 | 825,497 |
| 1882 | 944,693 |
| 1883 | 583,985 |
| 1884 | 440,955 |
| 1885 | 339,600 |

b

*Production of the most important districts (chiefly magnetites and hematites).*

| District. | 1883. | 1884. |
|---|---|---|
| | *Tons.* | *Tons.* |
| Lake Superior | 2,634,562 | 2,750,634 |
| Vermilion lake, Minnesota | Not opened. | 69,578 |
| Missouri | 330,881 | 261,212 |
| Cornwall, Pennsylvania | 443,034 | 461,798 |
| Chateaugay, Lake Champlain | 218,068 | 240,121 |
| Other Lake Champlain mines | 372,466 | 325,360 |
| New Jersey | 583,985 | 440,955 |

c

Mr. Swank's table just quoted shows the world's output of ore to have been in 1882 over 52,000,000 tons. This is roughly six and one-half times as much as the 805 mines of the United States produced in the census year. The ability of the ore deposits of the world to meet this immense demand will undoubtedly be one of the great questions of the near future. But vast as this amount of ore appears to be, it is small compared with that which will be required to meet the demands of the future if the rate of increase continues which has ruled in the past. China, Siberia, southern Asia, South America, the great islands of the world, and Africa will each go to swell the demands for construction, and multiply the already enormous requirement for maintenance.

d We have not the data for directly determining the rate of growth of the iron-ore production at home or for the world; but it is probable that if we had the data with which to construct the curve of ore production for the world, we should find that it would follow very closely the curve of pig-iron production.

On the accompanying diagram (Fig. 7*a*) Mr. Putnam has platted —

I. The production of pig-iron in the United States between 1854 and 1885.

II. The production of pig iron in Great Britain between 1856 and 1885.

III. The output of the Lake Superior mines between 1856 and 1885.

IV. The output of the New Jersey mines between 1867 and 1885.

The following table by Mr. Jeans, and here copied from Mr. Bell's *Principles of Iron and Steel Manufacture*, gives the consumption per head throughout the world:

e

| Iron-producing countries. | Population. | Iron all kinds, tons consumed. | Pounds per head consumed. |
|---|---|---|---|
| United Kingdom | 35,968,000 | 4,618,932 | 287.53 |
| United States | 50,152,866 | 6,005,919 | 270.92 |
| France | 37,672,048 | 2,508,706 | 149.16 |
| Germany | 45,194,177 | 2,488,957 | 123.36 |
| Belgium | 5,519,844 | 587,000 | 238.20 |
| Russia | 88,000,000 | 965,000 | 24.56 |
| Austrian territories | 37,741,434 | 625,000 | 37.09 |
| Sweden and Norway | 6,391,098 | 220,000 | 77.07 |
| Total | 306,639,467 | 18,079,514 | 132.07 |
| Other countries of Europe, none of which can be regarded as iron-producing. | 91,694,283 | 978,449 | 23.90 |
| Total for Europe and the United States | 398,333,750 | 19,057,963 | 107.16 |
| British Possessions, exclusive of India | 11,465,079 | 621,483 | 121.40 |
| Total | 409,798,829 | 19,679,446 | 107.57 |
| British Possessions in India | 446,759,606 | 481,951 | 2.40 |
| Egypt | 5,517,000 | 18,614 | 7.55 |
| South America and islands | 45,449,357 | 274,353 | 13.50 |
| Asia, exclusive of British Possessions | 517,161,778 | 113,382 | .49 |
| Total | 1,424,686,570 | 20,567,746 | 32.33 |

f

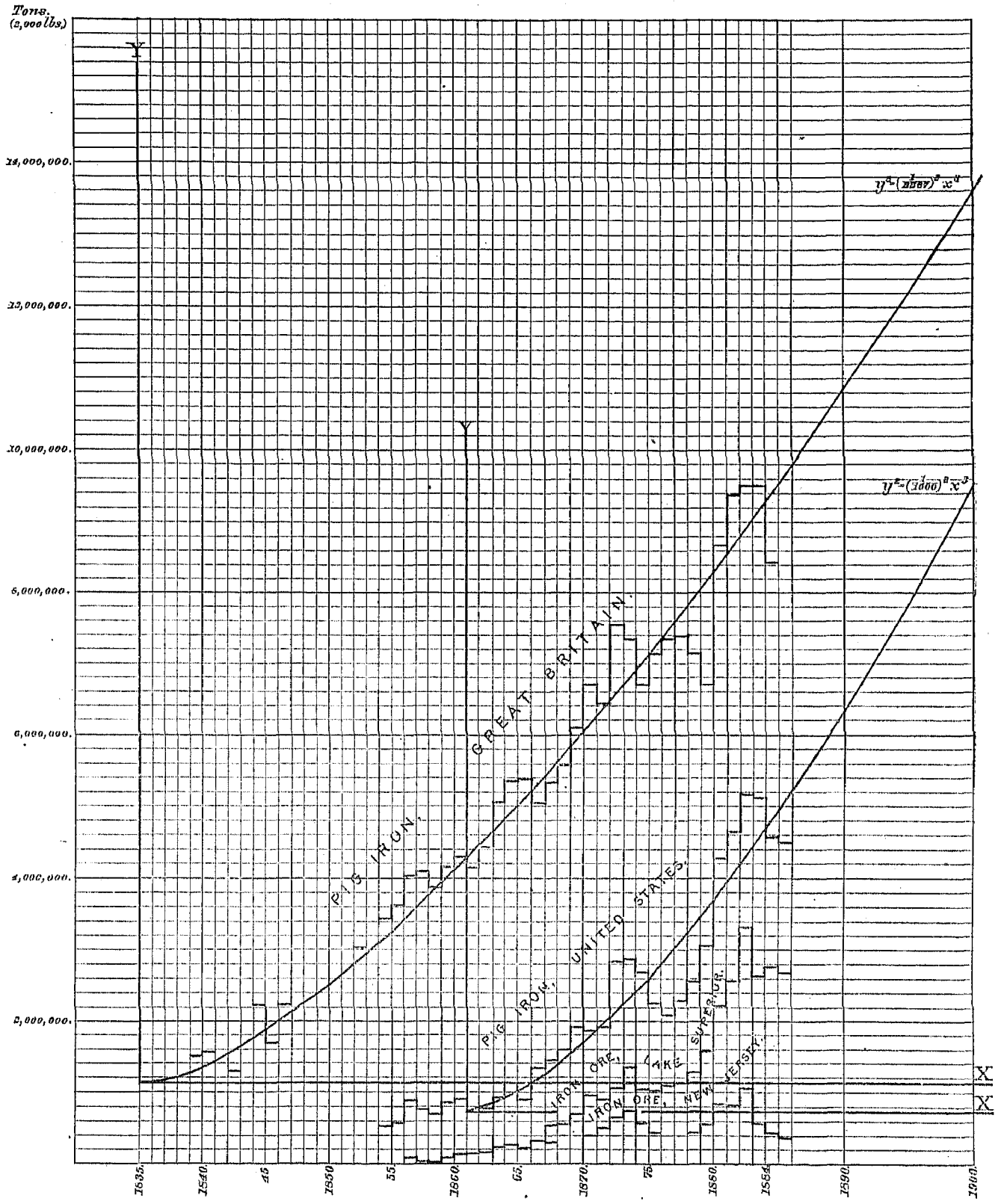



FIG. 7*a*.

The curves on the diagram which show the average increase in the production of pig-iron in Great Britain and in the United States are of such forms that, in the case of Great Britain, for instance, the area bounded by the curve, the axis of abscissas, and the ordinate at any year, indicates very closely (*a*) the total production of iron from 1835 to that year; and in the case of the United States a similarly bounded area indicates the total production of iron from 1861 to the given year. The rate of increase of production in the United States since 1861 has been a little greater than that in Great Britain since 1835. As will be seen, the two curves, although of the same general form of equation ($y^2=a^2 x^3$), have different values assigned to their constants, so that the curves are not precisely parallel. In 1866 the United States had reached the production of Great Britain in 1835, that is to say, she was then thirty-one years behind the latter country. At the end of 1884 she was but twenty-one years behind England. And at the same rate of increase for both countries, the United States will be but fifteen years behind England in 1900, and will reach and pass her in 1950, the production of pig-iron in each country for that year, as determined from the equation of their respective curves, being a little over 30,000,000 tons. [B. T. P.]

*a* Or, to be more precise, the area representing the production of pig-iron in Great Britain for the decade 1860–'69 differs from that bounded by the base, the ordinate at the beginning of 1860, the ordinate at the end of 1869, and the curve (*i. e.*, the actual tonnage for this period differs from the computed tonnage) by thirty-three hundredths of 1 per cent., the actual tonnage area being the larger. The area representing the production for the decade 1870–'79 differs from that bounded by the base, the ordinate at the beginning of 1870, the ordinate at the end of 1879 and the curve (*i. e.*, the actual tonnage for this period differs from the computed tonnage) by twenty-six hundredths of 1 per cent., the actual tonnage area being the smaller. The computed tonnage for the above two periods combined (*i. e.*, from 1860 to 1879, both years inclusive) is less than five thousandths of 1 per cent. larger than the actual tonnage. [B. T. P.]

In 1881 our consumption per head was, according to Mr. Jeans, 270.9 pounds, while that of Great Britain was **a** 287.5 pounds, and that of Europe and the United States together 107 pounds, and of the world at large about 32 pounds. Therefore, we have not yet reached the rate of consumption that obtains in Great Britain.

The increase of population, the disappearance of forests, and the constantly widening range of application of iron on both a large and a small scale, would, if continued as in the past, largely increase its use per head in the coming century. All this would imply a corresponding drain on the mines of our country, which it is doubtful that they could respond to. When we consider the comparative shallowness of the fossil-ore deposits and the lack of continuity of the limonite bodies, it seems doubtful whether they would not be exhausted within a half century, leaving the main reliance upon the high- and low-grade ores of the Archæan areas, and on the thin beds of Carboniferous ores. **b**

If the production of pig-iron in the United States continues to increase at the same rate that it did from 1861 to 1885, there will be produced from 1885 to 1900, as is shown by Mr. Putnam's curve, (*a*) *a total of 87,250,000 tons*, equal to 185,800,000 tons of ore carrying 45 per cent. of iron. This is equivalent to a bed 1 yard thick and covering an area of $17\frac{9}{10}$ square miles.

The total predicted between 1885 and 1950—nearly 1,060,000,000 tons—is equivalent to 3,180,000,000 tons of ore carrying $33\frac{1}{3}$ per cent. of iron This amount would cover to a depth of 1 yard an area of $342\frac{2}{10}$ square miles; or it would form a deposit 3 feet thick extending 900 feet in depth and $2{,}007\frac{6}{10}$ miles in length.

The more immediate result will be, as before stated, the rapid exhaustion of the known deposits of rich ores and the more extensive mining of those of lower grades.

To bring Asia and South America up to the same consumption per head as Russia, or say 25 pounds, would **c** require an increase in the world's product of about 30,000,000 tons of 40 per cent. ore.

But if no unforeseen cause should intervene, the coming century will see the habitable lands of the whole globe divided among and occupied by rapidly-increasing populations of European and of Chinese descent. Should there be nothing substituted for iron, it is difficult to see how they could do with a smaller consumption per head than that of Europe and the United States, or say 100 pounds, and it would require probably more than 100,000,000 tons of ore annually to supply the demand before the end of this century.

If we may assume that the curve of the world's production from 1885 to 1950 will approximate in shape that of Great Britain, and that this will continue to be of the same form as it was from 1835 to 1885, (*b*) then taking the world's output of ore in 1882 at 52,000,000 tons, or $2\frac{8}{10}$ times that of Great Britain, there would be required for the period from 1885 to 1900 a total of over 1,454,000,000 tons. This would cover 1 yard deep an area of $156\frac{3}{10}$ square **d** miles; or occupy a deposit 1 yard thick, 900 feet deep, and $917\frac{3}{10}$ miles long.

For the period from 1885 to 1950 there would be required, under like assumptions, the enormous amount of nearly 10,635,000,000 tons, equal to a bed 1 yard thick covering $1{,}144\frac{4}{10}$ square miles; or to a deposit 1 yard thick, 900 feet deep, and 6,714 miles long.

There can be little doubt that the invention of new kinds of steel will tend to largely increase the efficiency and durability of the metal, and so diminish the amount used up in maintenance.

There can also be little doubt that aluminum will become an available metal, and that this and other light materials will be used for many purposes for which only iron and steel are now employed. But it may well be doubted whether this saving will not be compensated by a more extended application of iron in other directions.

---

*a* The ordinates for every fifth year were computed by the formula: $Y^2=(\frac{1}{1500})^2X^3$; in which $Y=1=2{,}000{,}000$ net tons, and $X=0.9=$ten years. To the value of Y (expressed in tons) was added in every case 731,544 tons, being the production of pig-iron in 1861. The area of each five-year period was then computed on the assumption that the curve between consecutive five-year ordinates does not differ sensibly from a straight line.

*b* $Y^2=(\frac{1}{2267})^2X^3$. The total production for Great Britain and the world was computed by means of this formula in a manner similar to that above described for computing the total production of the United States.

# THE CENTER OF TOTAL PRODUCTION OF IRON ORE IN THE UNITED STATES IN THE CENSUS YEAR.

By Bayard T. Putnam.

The center of total production of iron ore in the United States, using the expression as defined for the center of population, in the *Statistical Atlas of the United States* (1874), and in the volume on the *Population of the United States* (1880), is the point at which equilibrium would be reached were the country taken as a plain surface, itself without weight, but capable of sustaining weight, and loaded with the iron ore produced during the period under consideration at the points where it was mined, each ton exerting pressure on the pivotal point directly proportioned to its distance therefrom.

The center of production of iron ore in the United States in the census year is found to be at latitude 41° 48⅓′ north, longitude 80° 14⅓′ west from Greenwich. This point is in Cussewago township, Crawford county, Pennsylvania, about 12 miles north, 23½° west from Meadville, and midway between Potter's Corner post-office and Crossingville post-office.

In determining this center the production of iron ore in each county was assumed to be concentrated at the geographical center of the county, excepting in cases where such an assumption was manifestly erroneous.(*a*) The geographical center of a county was considered as being coincident with the center of gravity of a plane of uniform weight, of the exact shape of the county. It was obtained practically by cutting out carefully the county from a map (scale 50 miles to the inch), and ascertaining the center of gravity of the piece by supending it successively at three points and finding the intersection of the vertical lines through the points of suspension. The geographical centers of the counties thus obtained were platted on a map. These several centers of ore-production were then grouped graphically, in accordance with the mechanical principle that the sum of two forces, acting at a point between them, and distant from either inversely as the force, exerts the same pressure on the pivotal point as the two forces acting separately. The resultant of the two counties was combined with a third county, and so on, until the resultant of the whole state, or in other words, the center of production of the state, was obtained. The latitudes and longitudes of the several state centers were then determined by measurement, and the moment of each state, with reference to an assumed meridian and parallel as axes calculated in the ordinary manner, *i. e.*, by multiplying its output in tons by the difference in latitude (expressed in minutes) between its center and the assumed parallel for the north or south moment; and by the difference in longitude (measured on the nearest half-degree-parallel and expressed in yards) between its center and the assumed meridian for the east or west moments. The difference between the sums of the east and west moments divided by the total product of ore in the United States gave a correction for the position of the assumed meridian, that is for the longitude of the center; and a correction for the latitude of the center was similarly determined.

The method of combining the counties as above explained will give necessarily a result for the position of the center differing somewhat from that obtained by calculating the moment of each county, as in the latter case the distance from the pivotal point, *i. e.*, the length of the lever by which the force exerts the pressure, is measured on the parallel and meridian, while it is not so measured in the graphic method. But the difference is very slight, especially within the area of any one state. The position of the center of the total production of the whole United States, as obtained by the use of the graphic method throughout, was latitude 41° 52′ north, longitude 80° 10′ west, which differs from that obtained by calculation of the movements of the several state centers by less than 4′ in latitude and about the same amount in longitude. It is scarcely necessary to say that of the two methods the graphic is very much less laborious.

*a* For instance, only one mine in each of the states of Maine and Oregon produced ore in the census year; the center of production of these states was therefore taken as at these mines. Again, all the mines in Saint Lawrence county, New York, are in the southern part of the county, near Gouverneur, and that town was consequently taken as the center of production of the county, etc.

**a** The "center", as above defined, is the one used in all the census reports thus far published. It is not the only point, however, which might be taken as satisfying the expression, *the center of total production*, and it moreover has a disadvantage in giving undue importance to a ton of product, simply because the latter is at a relatively great distance from the center. The 7,000 tons of ore mined in Oregon have as much influence in determining the longitude of the center of total production as 70,000 tons mined in Preston county, West Virginia.

Another "center" of total production might, for the purpose of indicating the average movement of the industry during a given period, be defined as being at the intersection of a meridian and parallel, the former dividing the east and west production equally, the latter dividing the north and south production equally. Such a center of the production of iron ore in the census year is in about latitude 40° 51′ north, longitude 77° 40′ west. This point is in the east central part of Centre county, Pennsylvania.

Both of the above points are indicated on the map of the United States, Plate XIV.

# STATISTICS

OF THE

# PRODUCTION OF IRON ORE IN THE CENSUS YEAR.

TABLE 14.—*Statistics of the production of iron ore, by states and counties.*

[GENERAL REMARKS.—With the exceptions of columns 5 and 6, in which the regular and irregular product are combined, all the questions in columns 1 to 40, both full year's production at the rate of the monthly production during the census year. *Capital in real estate* refers to mineral right only. *Working capital*, when the original figures have been replaced by estimates. *Furnaces:* Great care has been taken to avoid duplication of the products of regular mines in entering ores to their true sources as far as possible. Further explanations will be found under each state. The full title of Mr. Swank's report, referred to in the

ALABAMA.

| | Counties. | Number of establishments. | Maximum capacity of yearly production. | Product of establishments, census year. | Value of product of establishments. | Total product, census year, i. e., product of establishments and irregular product together. | Value of total product. | EMPLOYÉS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Men employed below ground. | Boys employed below ground. | Men employed above ground. | Boys employed above ground. | Total number of employés. |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | The State | 17 | *Tons.* 310,100 | *Tons.* 184,110 | $189,108 | *Tons.* 191,076 | $201,865 | 109 | 6 | 590 | 33 | 738 |
| 1 | Bibb | 1 | 28,350 | 5,670 | 6,250 | 5,670 | 6,250 | ..... | ..... | 24 | 2 | 26 |
| 2 | Calhoun | 2 | 25,574 | 24,474 | 26,812 | 27,842 | 32,120 | ..... | ..... | 52 | 6 | 58 |
| 3 | Cherokee | 4 | 40,948 | 32,996 | 32,500 | 32,996 | 32,500 | ..... | ..... | 122 | 1 | 123 |
| 4 | De Kalb | 1 | 2,721 | 227 | 250 | 227 | 250 | ..... | ..... | 10 | ..... | 10 |
| 5 | Etowah | 2 | 21,340 | 21,004 | 22,152 | 21,004 | 22,152 | 20 | 1 | 24 | 1 | 46 |
| 6 | Jefferson | 3 | 72,200 | 45,975 | 49,461 | 45,975 | 49,461 | 71 | 3 | 155 | ..... | 229 |
| 7 | Shelby | 1 | 26,000 | 25,787 | 25,787 | 25,787 | 25,787 | ..... | ..... | 40 | 15 | 55 |
| 8 | Saint Clair | 1 | 34,020 | 12,685 | 16,779 | 12,685 | 16,779 | 18 | 2 | 80 | 8 | 108 |
| 9 | Talladega | 1 | 13,608 | 1,140 | 1,005 | 5,338 | 8,445 | ..... | ..... | 50 | ..... | 50 |
| 10 | Tuscaloosa | 1 | 36,288 | 14,152 | 8,112 | 14,152 | 8,112 | ..... | ..... | 33 | ..... | 33 |

CONNECTICUT.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 4 | 45,800 | 35,018 | $147,799 | 35,018 | $147,779 | 20 | ..... | 179 | 1 | 200 |
| 1 | Litchfield | 4 | 45,800 | 35,018 | 147,799 | 35,018 | 147,799 | 20 | ..... | 179 | 1 | 200 |

DELAWARE.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 2 | 18,389 | 2,726 | $6,553 | 2,726 | $6,553 | ..... | ..... | 36 | 11 | 47 |
| 1 | New Castle | 2 | 18,389 | 2,726 | 6,553 | 2,726 | 6,553 | ..... | ..... | 36 | 11 | 47 |

GEORGIA.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 7 | 101,157 | 72,705 | $120,602 | 91,416 | $143,622 | 50 | ..... | 287 | 5 | 342 |
| 1 | Bartow | 4 | 20,520 | 10,623 | 24,562 | 11,353 | 27,762 | ..... | ..... | 87 | 5 | 92 |
| 2 | Dade | 1 | 44,225 | 44,225 | 77,393 | 47,206 | 82,123 | 50 | ..... | 150 | ..... | 200 |
| 3 | Polk | 2 | 27,412 | 17,857 | 18,737 | 32,857 | 33,737 | ..... | ..... | 50 | ..... | 50 |

KENTUCKY.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 5 | 105,420 | 33,522 | $88,930 | 64,809 | $165,905 | 45 | ..... | 255 | 25 | 325 |
| 1 | Bath | ..... | ..... | ..... | ..... | 550 | 1,375 | ..... | ..... | ..... | ..... | ..... |
| 2 | Boyd | ..... | ..... | ..... | ..... | 3,271 | 8,556 | ..... | ..... | ..... | ..... | ..... |
| 3 | Carter | 1 | 5,670 | 2,495 | 6,000 | 14,749 | 39,258 | ..... | ..... | 25 | ..... | 25 |
| 4 | Estill | ..... | ..... | ..... | ..... | 1,500 | 3,000 | ..... | ..... | ..... | ..... | ..... |
| 5 | Greenup | 2 | 26,000 | 13,917 | 42,955 | 14,058 | 43,479 | ..... | ..... | 162 | 25 | 187 |
| 6 | Lyon | 1 | 50,700 | 8,505 | 16,875 | 8,505 | 16,875 | 20 | ..... | 42 | ..... | 62 |
| 7 | Powell | ..... | ..... | ..... | ..... | *1,500* | *3,000* | ..... | ..... | ..... | ..... | ..... |
| 8 | Trigg | 1 | 17,050 | 8,605 | 22,500 | 8,605 | 22,500 | 25 | ..... | 26 | ..... | 51 |
| 9 | Boyd and Greenup | ..... | ..... | ..... | ..... | 11,435 | 25,670 | ..... | ..... | ..... | ..... | ..... |
| 10 | Name of county not given | ..... | ..... | ..... | ..... | 636 | 2,102 | ..... | ..... | ..... | ..... | ..... |

INDIANA.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | ..... | ..... | ..... | ..... | 513 | $1,018 | ..... | ..... | ..... | ..... | ..... |
| 1 | Martin | ..... | ..... | ..... | ..... | 513 | 1,018 | ..... | ..... | ..... | ..... | ..... |

## TABLE 14.—*Statistics of the production of iron ore, by states and counties.*

inclusive, relate to regular establishments only. *Tons* are of 2,000 pounds throughout. *Maximum capacity*, when not returned, has been estimated as equal to one not returned, has been estimated as equal to one month's wages and materials. *Employés:* Wherever the maximum instead of the average number was returned, the amounts mined or bought by furnaces. In computing these amounts all the blast-furnace returns from the neighboring states were consulted, so as to trace the remarks, is *Statistics of the Iron and Steel Production of the United States, compiled by James M. Swank, special agent of the Census.*]

### ALABAMA.

| EMPLOYÉS. | | | | CAPITAL. | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of miners. | Number of laborers. | Number of administrative force. | Total wages paid. | Value of real estate. | Value of plant. | Amount used as working capital. | Total capital employed and invested. | Number of mining company's stores. | Value of all materials used. | Number of horses. | Value of horses. | Number of mules. | Value of mules. | |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | |
| 503 | 216 | 10 | $123,342 | $438,772 | $46,770 | $50,900 | $536,442 | 9 | $17,025 | a 73 | b $2,835 | 107 | $11,070 | |
| 24 | 2 | ..... | 2,638 | 3,500 | 2,830 | 6,000 | 12,330 | 1 | 800 | ..... | ..... | 6 | 630 | 1 |
| 56 | ..... | 2 | 14,140 | 30,503 | 2,600 | 1,200 | 34,300 | 1 | 1,100 | ..... | ..... | 5 | 750 | 2 |
| 110 | 13 | ..... | 27,270 | 77,000 | 5,800 | 4,800 | 87,600 | 2 | 4,000 | 60 | 1,400 | 10 | 1,000 | 3 |
| 10 | ..... | ..... | 300 | 1,500 | 100 | 500 | 2,100 | ..... | 200 | ..... | ..... | ..... | ..... | 4 |
| 12 | 30 | 4 | 13,247 | 3,000 | 3,000 | 1,400 | 7,400 | 1 | 2,100 | 4 | 320 | 14 | 1,400 | 5 |
| 211 | 16 | 2 | 25,002 | 103,000 | 12,500 | 7,500 | 123,000 | 1 | 3,520 | ..... | ..... | 3 | 240 | 6 |
| 30 | 24 | 1 | 15,000 | 99,772 | 7,165 | 15,000 | 121,937 | 1 | 1,505 | 2 | 250 | 12 | 1,300 | 7 |
| 29 | 82 | 6 | 18,480 | 15,500 | 6,000 | 8,000 | 29,500 | 1 | 2,200 | 2 | 200 | 35 | 3,500 | 8 |
| ..... | 49 | 1 | 1,005 | 100,000 | 2,675 | 500 | 103,175 | ..... | 200 | 4 | 600 | 20 | 2,000 | 9 |
| 30 | ..... | 3 | 6,260 | 5,000 | 4,100 | 6,000 | 15,100 | 1 | 2,000 | 1 | 65 | 2 | 250 | 10 |

a Includes 64 oxen. b Includes value of 64 oxen.

### CONNECTICUT.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 100 | 90 | 10 | $61,167 | $308,000 | $39,800 | $18,500 | $426,300 | ..... | $20,853 | 98 | $11,950 | ..... | ..... | |
| 100 | 90 | 10 | 61,167 | 308,000 | 39,800 | 18,500 | 426,300 | ..... | 20,853 | 98 | 11,950 | ..... | ..... | 1 |

### DELAWARE.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20 | 25 | 2 | $2,865 | $40,000 | $6,300 | $2,000 | $48,300 | ..... | $941 | 6 | $400 | 16 | $1,140 | |
| 20 | 25 | 2 | 2,865 | 40,000 | 6,300 | 2,000 | 48,300 | ..... | 941 | 6 | 400 | 16 | 1,140 | 1 |

### GEORGIA.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 217 | 105 | 20 | $108,706 | $101,200 | $33,035 | $35,790 | $170,025 | 4 | $8,345 | ..... | ..... | 68 | $8,650 | |
| 46 | 46 | 6 | 10,706 | 16,800 | 6,285 | 2,790 | 25,875 | 1 | 2,025 | ..... | ..... | 38 | 4,750 | 1 |
| 125 | 65 | 10 | 90,000 | 75,000 | 25,000 | 30,000 | 130,000 | 1 | 5,210 | ..... | ..... | 22 | 2,500 | 2 |
| 46 | ..... | 4 | 8,000 | 9,400 | 2,650 | 3,000 | 15,050 | 2 | 1,110 | ..... | ..... | 8 | 1,400 | 3 |

### KENTUCKY.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 224 | 88 | 13 | $60,319 | $678,320 | $59,580 | $42,000 | $779,829 | 2 | $3,100 | 91 | $8,300 | 26 | $1,500 | |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2 |
| 20 | 3 | 2 | 5,500 | 101,000 | 40,000 | 7,000 | 148,000 | 1 | 100 | ..... | ..... | ..... | ..... | 3 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4 |
| 124 | 55 | 8 | 36,819 | 427,320 | 4,500 | 15,000 | 446,829 | ..... | ..... | 26 | 1,300 | 26 | 1,500 | 5 |
| 40 | 20 | 2 | 12,000 | 50,000 | 5,000 | 10,000 | 65,000 | ..... | 3,000 | 40 | 4,500 | ..... | ..... | 6 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 7 |
| 40 | 10 | 1 | 15,000 | 100,000 | 10,000 | 10,000 | 120,000 | 1 | 5,000 | 25 | 2,500 | ..... | ..... | 8 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 9 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 |

### INDIANA.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 |

TABLE 14.—*Statistics of the production of iron ore, by states and counties*—Continued.

ALABAMA.

| | Counties. | STEAM-POWER. Number of steam-engines. | Value of steam-engines. | Horse-power of steam-engines. | Number of boilers. | Value of boilers. | Horse-power of boilers. | Amount of wood used for fuel. | Value of cord-wood. | Amount of unsawed lumber (other than for fuel). | Value of unsawed lumber. | Amount of sawed lumber. | Value of sawed lumber. | Cost of explosives. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 |
| | | | | | | | | *Cords.* | | *Lin. feet.* | | *Ft. B. M.* | | |
| | The State | 6 | $4,550 | 192 | 6 | $2,250 | 192 | 1,536 | $2,680 | 31,000 | $310 | ..... | ..... | $4,240 |
| 1 | Bibb | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 600 |
| 2 | Calhoun | 2 | 450 | 20 | 2 | 300 | 20 | 450 | 640 | ..... | ..... | ..... | ..... | ..... |
| 3 | Cherokee | 2 | 1,000 | 22 | 2 | 450 | 22 | 101 | 300 | ..... | ..... | ..... | ..... | 1,057 |
| 4 | De Kalb | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 185 |
| 5 | Etowah | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 15,000 | 150 | ..... | ..... | 552 |
| 6 | Jefferson | ..... | ..... | ..... | ..... | ..... | ..... | 310 | 930 | ..... | ..... | ..... | ..... | 1,350 |
| 7 | Shelby | 1 | 1,100 | 50 | 1 | 500 | 50 | 365 | 547 | 1,000 | 10 | ..... | ..... | ..... |
| 8 | Saint Clair | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 15,000 | 150 | ..... | ..... | 216 |
| 9 | Talladega | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 10 | Tuscaloosa | 1 | 2,000 | 100 | 1 | 1,000 | 100 | 310 | 263 | ..... | ..... | ..... | ..... | 280 |

CONNECTICUT.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 5 | $2,800 | 105 | 6 | $5,200 | 135 | 5 | $25 | 2,100 | $105 | 20,000 | $325 | $3,669 |
| 1 | Litchfield | 5 | 2,800 | 105 | 6 | 5,200 | 135 | 5 | 25 | 2,100 | 105 | 20,000 | 325 | 3,669 |

DELAWARE.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 4 | $2,500 | 40 | 3 | $1,300 | 28 | 23 | $53 | ..... | ..... | ..... | ..... | $3 |
| 1 | New Castle | 4 | 2,500 | 40 | 3 | 1,300 | 28 | 23 | 53 | ..... | ..... | ..... | ..... | 3 |

GEORGIA.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | ..... | ..... | ..... | 1 | $300 | 20 | ..... | ..... | ..... | ..... | ..... | ..... | $4,200 |
| 1 | Bartow | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 625 |
| 2 | Dade | ..... | ..... | ..... | 1 | 300 | 20 | ..... | ..... | ..... | ..... | ..... | ..... | 3,000 |
| 3 | Polk | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 575 |

KENTUCKY.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10,000 | $500 | ..... | ..... | $1,470 |
| 1 | Bath | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 2 | Boyd | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 3 | Carter | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 4 | Estill | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 5 | Greenup | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 6 | Lyon | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 720 |
| 7 | Powell | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 8 | Trigg | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10,000 | 500 | ..... | ..... | 750 |
| 9 | Boyd and Greenup | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 10 | Name of county not given | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

INDIANA.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 1 | Martin | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

TABLE 14.—*Statistics of the production of iron ore, by states and counties*—Continued.

ALABAMA.

| Value of all machinery. | Value of buildings. | IRREGULAR PRODUCTION. Mined by furnaces. Product, census year. | Value of product. | Value of tools and machinery. | Estimated value of labor in producing and bringing to furnace. | Bought by furnaces. From small mines within the county, census year. | Amount paid for this ore. | Remarks. | |
|---|---|---|---|---|---|---|---|---|---|
| 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | | |
| | | *Tons.* | | | | *Tons.* | | | |
| $17,765 | $6,050 | ..... | ..... | ..... | ..... | 7,566 | $12,757 | *Capital in real estate*, when not returned, has been estimated equal to the royalty on six full years' production at the rate of the monthly production during the census year. | |
| ..... | 1,200 | ..... | ..... | ..... | ..... | ..... | ..... | *Wages* are probably "net," as most of the mines are open-cut and wages are generally low. | 1 |
| 750 | 1,000 | ..... | ..... | ..... | ..... | 3,368 | 5,317 | | 2 |
| 2,950 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | *Materials* include powder, lumber, fuel, and feed for oxen, horses, and mules. Feed for oxen has been estimated at $1 per month, feed for horses at $6 per month, and feed for mules at $6 per month. To total materials may be added $1,362 for half-feed of horses and mules during idle time of mines temporarily suspending operations during the census year. | 3 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | 4 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | 5 |
| 5,000 | 3,000 | ..... | ..... | ..... | ..... | ..... | ..... | *Furnaces:* The following data, referring to mines operated in connection with furnaces, are probably duplicated by Mr. Swank's returns: Number of mines, 5. Product, 76,594 tons; value, $72,678. Employés, 216; wages, $39,335. Real estate, $257,000; plant, $17,475; working capital, $5,800; total capital, $280,275. | 6 |
| 5,565 | 400 | ..... | ..... | ..... | ..... | ..... | ..... | | 7 |
| ..... | 450 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8 |
| ..... | ..... | ..... | ..... | ..... | ..... | 4,198 | 7,440 | ..... | 9 |
| 3,500 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 |

CONNECTICUT.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $22,225 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | |
| 22,225 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 |

DELAWARE.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $4,400 | $150 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | |
| 4,400 | 150 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 |

GEORGIA.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $1,250 | $16,800 | ..... | ..... | ..... | ..... | 18,711 | $22,930 | *Capital in real estate*, when not returned, has been estimated as equal to the royalty on six full years' production at the rate of the monthly production in the census year. | |
| ..... | ..... | ..... | ..... | ..... | ..... | 730 | 3,200 | *Materials* include powder, fuel, lumber, and feed, the latter estimated at $5 per head per working month. To the total materials for the state may be added $615 for half-feed for horses and mules during idle time of mines temporarily suspending operations during the census year. | 1 |
| 1,000 | 15,000 | ..... | ..... | ..... | ..... | 2,981 | 4,730 | | 2 |
| 250 | 1,800 | ..... | ..... | ..... | ..... | 15,000 | 15,000 | *Furnaces:* The following returns of mines operated in connection with furnaces are probably duplicated by Mr. Swank's returns: Number of mines, 3. Product, 21,441 tons; value, $20,037. Employés, 104; wages, $10,160. Real estate, $11,400; plant, $5,150; working capital, $5,000; total capital, $21,550. | 3 |

KENTUCKY.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ..... | ..... | 4,940 | $10,155 | ..... | $6,000 | 26,347 | $66,820 | *Wages* represent net wages. | |
| ..... | ..... | 550 | 1,375 | ..... | ..... | ..... | ..... | *Materials* include powder, lumber, fuel, etc., and feed, estimated at $6 per head per month. Feed has been added to the original returns. To total materials may be added $1,092 for half-feed of horses and mules during idle time of mines temporarily suspending operations during census year. | 1 |
| ..... | ..... | 1,390 | 2,780 | ..... | ..... | 1,881 | 5,776 | | 2 |
| ..... | ..... | ..... | ..... | ..... | ..... | 12,254 | 32,058 | *Capital in real estate*, when not returned, has been estimated as equal to the royalty on six full years' production at the rate of the monthly production in the census year. | 3 |
| ..... | ..... | 1,500 | 3,000 | ..... | 3,000 | ..... | ..... | *Furnaces:* Among the returns from mines, the following from those operated by and in connection with furnaces are probably duplicated by Mr. Swank's report: Number of mines, 6. Product, 60,061 tons; value, $85,349. Employés, 307; wages, $61,296. Real estate, $541,000; plant, $80,959; working capital, $57,400; total capital, $679,359. | 4 |
| ..... | ..... | ..... | ..... | ..... | ..... | 141 | 524 | | 5 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | 6 |
| ..... | ..... | 1,500 | 3,000 | ..... | 3,000 | ..... | ..... | *Number of mines:* The 8,505 tons reported from one mine in Lyon county came from forty openings, each of which might be, inappropriately, called a mine. | 7 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | 8 |
| ..... | ..... | ..... | ..... | ..... | ..... | 11,435 | 25,670 | ..... | 9 |
| ..... | ..... | ..... | ..... | ..... | ..... | 636 | 2,192 | ..... | 10 |

INDIANA.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ..... | ..... | ..... | ..... | ..... | ..... | 513 | $1,018 | | |
| ..... | ..... | ..... | ..... | ..... | ..... | 513 | 1,018 | ..... | 1 |

TABLE 14.—*Statistics of the production of iron ore, by states and counties*—Continued.

MAINE.

| | Counties. | Number of establishments. | Maximum yearly capacity of production. | Product of establishments, census year. | Value of product of establishments. | Total product, census year, i. e., product of establishments and irregular product together. | Value of total product. | EMPLOYÉS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Men employed below ground. | Boys employed below ground. | Men employed above ground. | Boys employed above ground. | Total number of employés. |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | | | *Tons.* | *Tons.* | | *Tons.* | | | | | | |
| | The State | 1 | 12,000 | 6,000 | $9,000 | 6,000 | $9,000 | ..... | ..... | 20 | ..... | 20 |
| 1 | Piscataquis | 1 | 12,000 | 6,000 | 9,000 | 6,000 | 9,000 | ..... | ..... | 20 | ..... | 20 |

MARYLAND.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 13 | 145,200 | 57,940 | $118,050 | 139,628 | $421,691 | 12 | ..... | 295 | 22 | 329 |
| 1 | Anne Arundel | 1 | 10,000 | 2,472 | 8,000 | 6,184 | 22,487 | ..... | ..... | 25 | 5 | 30 |
| 2 | Alleghany | 1 | 50,400 | 3,253 | 7,200 | 4,512 | 11,788 | 8 | ..... | 1 | ..... | 9 |
| 3 | Baltimore | 7 | 33,376 | 25,536 | 51,032 | 63,842 | 196,647 | 4 | ..... | 127 | 15 | 146 |
| 4 | Carroll | 3 | 20,160 | 8,836 | 11,920 | 17,352 | 45,584 | ..... | ..... | 52 | ..... | 52 |
| 5 | Cecil | ..... | ..... | ..... | ..... | 2,016 | 8,004 | ..... | ..... | ..... | ..... | ..... |
| 6 | Frederick | 1 | 31,360 | 17,843 | 39,829 | 18,160 | 40,506 | ..... | ..... | 90 | 2 | 92 |
| 7 | Harford | ..... | ..... | ..... | ..... | 277 | 845 | ..... | ..... | ..... | ..... | ..... |
| 8 | Howard | ..... | ..... | ..... | ..... | 14,675 | 53,737 | ..... | ..... | ..... | ..... | ..... |
| 9 | Montgomery | ..... | ..... | ..... | ..... | 25 | 100 | ..... | ..... | ..... | ..... | ..... |
| 10 | Prince George | ..... | ..... | ..... | ..... | 12,019 | 41,433 | ..... | ..... | ..... | ..... | ..... |
| 11 | Washington | ..... | ..... | ..... | ..... | 500 | 500 | ..... | ..... | ..... | ..... | ..... |

MASSACHUSETTS.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 9 | 87,360 | 62,637 | $226,130 | 62,637 | $226,130 | 224 | ..... | 134 | 24 | 382 |
| 1 | Berkshire | 9 | 87,360 | 62,637 | 226,130 | 62,637 | 226,130 | 224 | ..... | 134 | 24 | 382 |

MICHIGAN.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 43 | 2,223,365 | 1,837,712 | $6,034,648 | 1,837,712 | $6,034,648 | 3,120 | 17 | 2,220 | 190 | 5,562 |
| 1 | Marquette | 31 | 1,589,959 | 1,346,365 | 4,675,430 | 1,346,365 | 4,675,430 | 2,394 | 16 | 1,480 | 126 | 4,016 |
| 2 | Menominee | 12 | 633,406 | 491,347 | 1,359,218 | 491,347 | 1,359,218 | 726 | 1 | 740 | 70 | 1,546 |

TABLE 14.—*Statistics of the production of iron ore, by states and counties*—Continued.

MAINE.

| EMPLOYÉS. | | | | CAPITAL. | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of miners. | Number of laborers. | Number of administrative force. | Total wages paid. | Value of real estate. | Value of plant. | Amount used as working capital. | Total capital employed and invested. | Number of mining company's stores. | Value of all materials used. | Number of horses. | Value of horses. | Number of mules. | Value of mules. | |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | |
| 12 | 8 | ..... | $9,000 | $2,500 | $2,000 | $2,000 | $6,500 | ..... | $3,150 | 16 | $1,600 | ..... | ..... | |
| 12 | 8 | ..... | 9,000 | 2,500 | 2,000 | 2,000 | 6,500 | ..... | 3,150 | 16 | 1,600 | ..... | ..... | 1 |

MARYLAND.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 110 | 102 | 18 | $61,138 | $310,600 | $135,464 | $44,450 | $490,514 | 2 | $28,720 | 37 | $5,600 | 45 | $6,100 | |
| ..... | 20 | 1 | 3,000 | 1,100 | 500 | 1,200 | 2,800 | ..... | 600 | ..... | ..... | ..... | ..... | 1 |
| 4 | 4 | 1 | 974 | 50,000 | 20,000 | 5,000 | 75,000 | ..... | 300 | 3 | 450 | 2 | 250 | 2 |
| 12 | 124 | 10 | 40,000 | 142,500 | 29,064 | 12,750 | 185,214 | 1 | 16,652 | 30 | 4,050 | 20 | 3,750 | 3 |
| 28 | 21 | 3 | 8,188 | 17,000 | 5,000 | 5,500 | 27,500 | ..... | 2,174 | 4 | 500 | ..... | ..... | 4 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 5 |
| 75 | 14 | 3 | 8,976 | 100,000 | 80,000 | 20,000 | 200,000 | 1 | 4,000 | ..... | ..... | 14 | 2,100 | 6 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 7 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 9 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 11 |

MASSACHUSETTS.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 216 | 156 | 10 | $117,158 | $183,000 | $70,000 | $22,400 | $276,000 | ..... | $43,136 | 50 | $6,575 | 2 | $200 | |
| 216 | 156 | 10 | 117,158 | 183,000 | 70,000 | 22,400 | 276,000 | ..... | 43,136 | 50 | 6,575 | 2 | 200 | 1 |

MICHIGAN.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3,103 | 2,189 | 210 | $2,573,857 | $12,452,311 | $2,780,044 | $2,254,520 | $17,486,775 | 14 | $939,711 | 390 | $64,350 | 37 | $4,070 | |
| 2,422 | 1,476 | 118 | 2,040,250 | 6,891,311 | 2,091,159 | 1,874,600 | 10,857,070 | 6 | 623,312 | 270 | 50,375 | 22 | 3,350 | 1 |
| 741 | 713 | 92 | 533,598 | 5,561,000 | 698,785 | 379,920 | 6,639,705 | 8 | 316,399 | 120 | 13,975 | 15 | 1,320 | 2 |

TABLE 14.—*Statistics of the production of iron ore, by states and counties*—Continued.

MAINE.

| Counties. | STEAM-POWER. | | | | | | Amount of wood used for fuel. | Value of cord-wood. | Amount of unsawed lumber (other than for fuel). | Value of unsawed lumber. | Amount of sawed lumber. | Value of sawed lumber. | Cost of explosives. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Number of steam-engines. | Value of steam-engines. | Horse-power of steam-engines. | Number of boilers. | Value of boilers. | Horse-power of boilers. | | | | | | | |
| | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 |
| | | | | | | | *Cords.* | | *Lin. feet.* | | *Ft. B. M.* | | |
| The State | | | | | | | | | | | | | $2,000 |
| 1 Piscataquis | | | | | | | | | | | | | 2,000 |

MARYLAND.

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 11 | $9,600 | 263 | 11 | $7,200 | 263 | 910 | $2,000 | | | | $789 |
| 1 | Anne Arundel | | | | | | | | | | | | |
| 2 | Alleghany | | | | | | | | | | | | |
| 3 | Baltimore | 8 | 5,400 | 173 | 8 | 5,400 | 173 | | | | | | 38 |
| 4 | Carroll | 1 | 700 | 30 | 1 | 800 | 30 | | | | | | 1 |
| 5 | Cecil | | | | | | | | | | | | 30 |
| 6 | Frederick | 2 | 3,500 | 60 | 2 | 1,000 | 60 | 910 | 2,000 | | | | 720 |
| 7 | Harford | | | | | | | | | | | | |
| 8 | Howard | | | | | | | | | | | | |
| 9 | Montgomery | | | | | | | | | | | | |
| 10 | Prince George | | | | | | | | | | | | |
| 11 | Washington | | | | | | | | | | | | |

MASSACHUSETTS.

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 8 | $9,600 | 220 | 19 | $13,450 | 455 | | | 33,628 | $2,354 | 25,000 | $350 | $6,818 |
| 1 | Berkshire | 8 | 9,600 | 220 | 19 | 13,450 | 455 | | | 33,628 | 2,354 | 25,000 | 350 | 6,818 |

MICHIGAN.

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 134 | $210,850 | 6,574 | 125 | $108,852 | 6,200 | 52,045 | $116,060 | 3,571,000 | $25,381 | 6,833,000 | $94,569 | $160,561 |
| 1 | Marquette | 112 | 181,450 | 5,891 | 97 | 84,882 | 5,060 | 34,675 | 83,112 | 1,231,000 | 13,381 | 4,048,000 | 60,689 | 144,190 |
| 2 | Menominee | 22 | 29,400 | 683 | 28 | 23,970 | 1,140 | 17,370 | 33,857 | 2,340,000 | 12,000 | 2,785,000 | 33,880 | 16,371 |

TABLE 14.—*Production of iron ore, by states and counties*—Continued.

MAINE.

| Value of all machinery. | Value of buildings. | IRREGULAR PRODUCTION. Mined by furnaces. Product, census year. | Value of product. | Value of tools and machinery. | Estimated value of labor in producing and bringing to furnace. | Bought by furnaces. From small mines within the county, census year. | Amount paid for this ore. | Remarks. | |
|---|---|---|---|---|---|---|---|---|---|
| 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | | |
| | | *Tons.* | | | | *Tons.* | | | |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | The original return for materials was $2,000, to which $1,500 has been added for feed. | 1 |

MARYLAND.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $17,164 | $9,000 | 3,581 | $12,244 | $3,600 | $4,094 | 78,107 | $291,397 | | |
| ..... | ..... | ..... | ..... | ..... | ..... | 3,712 | 14,487 | *Product of mines operated by furnaces:* Among the "mine schedules" proper there are 9 mines operated by and in connection with furnaces. The aggregate production of such mines was 33,593 tons, valued at $81,509; total number of employés, 170; total wages, $44,522; capital, in real estate, $107,500; in plant, $10,964; in working capital, $18,250; total capital, $295,714. These amounts are probably duplicated by Mr. Swank's returns. | 1 2 3 4 |
| 150 | 1,005 | 3,080 | 500 | 1,794 | 254 | 848 | | | |
| 13,004 | 5,450 | ..... | ..... | ..... | ..... | 38,306 | 145,615 | | |
| 1,700 | 1,800 | ..... | ..... | ..... | ..... | 8,516 | 33,655 | | |
| ..... | ..... | 2,016 | 8,064 | 3,100 | 1,800 | ..... | ..... | *Wages* represent the net earnings of employés. | 5 |
| 2,400 | 2,500 | ..... | ..... | ..... | ..... | 323 | 677 | *Materials* include coal, lumber, powder, fuse, oil, iron, tools, and feed. The latter reckoned at $9 per month per head (mule or horse), during the time the mine was in operation. To this may be added, for half-feed of mules and horses during idle time by mines temporarily suspending work during the census year, $1,676, making the total value of materials $25,402. | 6 7 8 |
| ..... | ..... | ..... | ..... | ..... | ..... | 277 | 845 | | |
| ..... | ..... | ..... | ..... | ..... | ..... | 14,675 | 53,737 | | |
| ..... | ..... | ..... | ..... | ..... | ..... | 25 | 100 | ..... | 9 |
| ..... | ..... | ..... | ..... | ..... | ..... | 12,019 | 41,433 | ..... | 10 |
| ..... | ..... | 560 | 500 | ..... | 500 | ..... | ..... | ..... | 11 |

MASSACHUSETTS.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $94,980 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | |
| 34,000 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 |

MICHIGAN.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $898,558 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | *Maximum capacity*, when not given, has been estimated equal to 8 months' production (in the case of open-cut mines), at the monthly rate of production during the census year, but in the case of mines which work wholly or partly underground, to 12 months' production. | |
| 770,558 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | 1 |
| 68,000 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | *Value at mine*, when not given, has been estimated at the price on ship-board for 1879, as given by the Marquette *Mining Journal*, less $1.50 per ton for railroad freight and loading ship. The values returned by the operators are, almost without exception, those ruling in 1879. As the ore mined during the spring of 1880, although not sold in the census year, was worth the prices brought by ores in 1880, which were about 50 per cent. higher than those of 1879, about 50 per cent. should be added to the value of one-half of the census year's production, *i. e.*, $1,508,662, making the aggregate value of the production for census year $7,543,310. | 2 |
| | | | | | | | | *Capital in real estate*, when not returned, has been estimated as equal to the royalty (when not given estimated at 50 cents per ton) on the production of 7½ full years at the rate of the monthly production during the census year. This is on the supposition that the mines will generally last not less than 10 years, the difference between 7½ and 10 being allowed for gain of interest. These estimates will seem low in proportion to the profits of the mines, but those profits do not represent those of the owners of mineral land but of the operators of the mines, and include interest on the capital invested in plant and on working capital, and the profits derived from the business of conducting the mines. | |
| | | | | | | | | *Wages* have been taken to represent the net earnings of miners, etc., as they are not high for the region. | |
| | | | | | | | | *Materials* include explosives, lumber, fuse, oil for lighting and lubricating, iron for all purposes, tools, etc., together with feed for horses and mules. It has been assumed that the latter was, as a rule, included in the original returns. Whenever the returns were not sufficiently large to include feed, $12 per working month per head has been added. To the total materials for the state should be added, for half-feed of horses and mules during idle time in the case of mines temporarily suspending operations during the census year, $2,783. | |
| | | | | | | | | *Lumber, unsawed*, when used and not returned, has been estimated at ¼ linear foot per ton of ore mined and valued at $\frac{5}{16}$ cent per linear foot, the price returned in many cases. To total amount of unsawed lumber add 25 stull pieces, returned in a "note", but included in value. | |
| | | | | | | | | *Cord-wood*, when not valued, has been estimated at $2 per cord. | |
| | | | | | | | | *Lumber, sawed*, when not valued, has been estimated at $12 per 1,000 feet, B. M. | |
| | | | | | | | | *Explosives*, when used and not given, have been estimated at 5, 8, and 13 cents per ton of ore mined, according to the purpose for which explosives were used and the kind of ore. | |

TABLE 14.—*Statistics of the production of iron ore, by states and counties*—Continued.

MISSOURI.

| | Counties. | Number of establishments. | Maximum yearly capacity of production. | Product of establishments, census year. | Value of product of establishments. | Total product, census year, *i. e.*, product of establishments and irregular product together. | Value of total product. | EMPLOYÉS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Men employed below ground. | Boys employed below ground. | Men employed above ground. | Boys employed above ground. | Total number of employés. |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | The State | 48 | *Tons.* 968,001 | *Tons.* 380,197 | $1,074,875 | *Tons.* 386,197 | $1,074,875 | 358 | 10 | 1,435 | 90 | 1,893 |
| 1 | Crawford | 14 | 169,487 | 87,033 | 210,368 | 87,033 | 210,368 | 47 | ..... | 338 | 1 | 446 |
| 2 | Dent | 15 | 167,604 | 58,878 | 160,071 | 58,878 | 160,071 | 8 | ..... | 376 | 20 | 404 |
| 3 | Franklin | 3 | 32,499 | 8,004 | 24,725 | 8,004 | 24,725 | 10 | ..... | 56 | ..... | 66 |
| 4 | Gasconade | 1 | ..... | 1,120 | 2,750 | 1,120 | 2,750 | ..... | ..... | 20 | ..... | 20 |
| 5 | Iron | 3 | 188,000 | 57,297 | 138,093 | 57,297 | 138,093 | 290 | 10 | 114 | 20 | 434 |
| 6 | Phelps | 0 | 66,926 | 29,326 | 76,435 | 29,326 | 76,435 | ..... | ..... | 190 | 4 | 194 |
| 7 | Saint Francois | 2 | 341,185 | 144,265 | 1,062,051 | 144,265 | 1,062,051 | 3 | ..... | 255 | 45 | 303 |
| 8 | Washington | 1 | 2,240 | 214 | 382 | 214 | 382 | ..... | ..... | 26 | ..... | 26 |

NEW JERSEY.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 109 | 1,487,820 | 754,872 | $2,900,442 | 757,372 | $2,910,442 | 3,264 | 69 | 1,385 | 93 | 4,811 |
| 1 | Bergen | 1 | 3,500 | 280 | 1,250 | 280 | 1,250 | ..... | ..... | 6 | ..... | 6 |
| 2 | Hunterdon | 18 | 74,642 | 10,627 | 82,515 | 10,627 | 82,515 | 141 | 1 | 98 | 8 | 248 |
| 3 | Morris | 55 | 1,034,813 | 508,420 | 2,353,819 | 508,420 | 2,353,819 | 2,451 | 52 | 830 | 57 | 3,390 |
| 4 | Passaic | 6 | 60,550 | 20,166 | 58,660 | 20,166 | 58,660 | 74 | 1 | 51 | 13 | 139 |
| 5 | Sussex | 15 | 225,250 | 87,165 | 244,776 | 89,665 | 254,776 | 349 | 6 | 226 | 6 | 587 |
| 6 | Warren | 14 | 89,074 | 50,214 | 159,422 | 50,214 | 159,422 | 249 | 9 | 174 | 9 | 441 |

NEW YORK.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 78 | 2,149,129 | 1,239,759 | $3,499,132 | 1,262,127 | $3,654,872 | 2,417 | 35 | 2,083 | 140 | 4,675 |
| 1 | Clinton | 6 | 290,692 | 92,166 | 354,584 | 92,166 | 354,584 | 510 | ..... | 293 | 10 | 813 |
| 2 | Columbia | 3 | 40,340 | 18,224 | 73,210 | 18,224 | 73,210 | ..... | ..... | 87 | 3 | 90 |
| 3 | Dutchess | 11 | 147,886 | 125,850 | 396,672 | 125,850 | 396,672 | ..... | ..... | 466 | 38 | 504 |
| 4 | Essex | 13 | 770,121 | 630,944 | 1,809,203 | 631,807 | 1,811,718 | 1,131 | 3 | 297 | ..... | 1,431 |
| 5 | Jefferson | 4 | 131,000 | 64,111 | 151,981 | 64,111 | 151,981 | 86 | ..... | 203 | ..... | 289 |
| 6 | Oneida | 6 | 99,720 | 37,052 | 63,899 | 37,052 | 63,899 | 60 | ..... | 155 | 15 | 230 |
| 7 | Orange | 16 | 138,620 | 88,988 | 254,434 | 89,562 | 256,030 | 277 | 14 | 131 | 5 | 427 |
| 8 | Putnam | 8 | 202,070 | 76,446 | 170,050 | 76,446 | 170,050 | 217 | 18 | 226 | 5 | 466 |
| 9 | Richmond | 3 | 37,840 | 8,288 | 14,530 | 9,318 | 18,033 | ..... | ..... | 41 | ..... | 41 |
| 10 | Saint Lawrence | 2 | 61,600 | 30,399 | 81,400 | 30,654 | 82,015 | 61 | ..... | 25 | ..... | 86 |
| 11 | Washington | 2 | 44,800 | 18,892 | 47,700 | 18,892 | 47,700 | 75 | ..... | 15 | 2 | 92 |
| 12 | Wayne | 4 | 97,440 | 48,390 | 81,370 | 48,390 | 81,370 | ..... | ..... | 144 | 62 | 206 |
| 13 | Name of county not given | ..... | ..... | ..... | ..... | *a* 19,040 | 147,001 | ..... | ..... | ..... | ..... | ..... |

*a* In table 8 this amount has been apportioned as follows: To Dutchess county, 795 tons; to Orange county, 1,180 tons; to Putnam county, 17,071 tons.

TABLE 14.—*Statistics of the production of iron ore, by states and counties*—Continued.

MISSOURI.

| EMPLOYÉS. | | | | CAPITAL. | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of miners. | Number of laborers. | Number of administrative force. | Total wages paid. | Value of real estate. | Value of plant. | Amount used as working capital. | Total capital employed and invested. | Number of mining company's stores. | Value of all materials used. | Number of horses. | Value of horses. | Number of mules. | Value of mules. | |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | |
| 1,126 | 600 | 77 | $417,371 | $4,066,228 | $678,313 | $254,020 | $5,598,556 | 7 | $104,955 | 67 | $5,015 | 241 | $31,370 | |
| 330 | 103 | 13 | 74,087 | 123,400 | 17,325 | 37,270 | 177,995 | 3 | 11,041 | 7 | 480 | 17 | 1,650 | 1 |
| 311 | 71 | 22 | 85,664 | 158,700 | 287,140 | 41,600 | 487,440 | 3 | 11,232 | 14 | 700 | 15 | 1,130 | 2 |
| 47 | 15 | 4 | 8,601 | 69,000 | 2,600 | 5,200 | 76,800 | ..... | 1,800 | 12 | 600 | 2 | 175 | 3 |
| 19 | ..... | 1 | 750 | ..... | ..... | 25 | 25 | ..... | 117 | ..... | ..... | ..... | ..... | 4 |
| 169 | 253 | 12 | 89,647 | 907,954 | 54,328 | 50,900 | 1,073,182 | ..... | 24,883 | 0 | 660 | 19 | 2,750 | 5 |
| 143 | 38 | 13 | 26,013 | 25,300 | 7,330 | 17,500 | 50,130 | ..... | 4,189 | 17 | 1,040 | 12 | 1,090 | 6 |
| 102 | 190 | 11 | 130,685 | 3,317,860 | 309,570 | 100,025 | 3,727,464 | 1 | 51,673 | 11 | 1,475 | 170 | 24,575 | 7 |
| 5 | 20 | 1 | 1,024 | 4,000 | 20 | 1,500 | 5,520 | ..... | 20 | ..... | ..... | ..... | ..... | 8 |

NEW JERSEY.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2,031 | 1,754 | 126 | $1,606,257 | $4,797,620 | $841,226 | $562,915 | $6,201,761 | 23 | $584,229 | 70 | $6,665 | 48 | $5,500 | |
| 4 | 1 | 1 | 200 | 8,000 | ..... | 250 | 8,250 | ..... | 50 | ..... | ..... | ..... | ..... | 1 |
| 150 | 75 | 14 | 38,426 | 101,150 | 44,225 | 18,115 | 163,490 | ..... | 12,515 | 11 | 1,140 | 8 | 1,000 | 2 |
| 2,097 | 1,225 | 68 | 1,298,615 | 2,962,720 | 654,674 | 407,725 | 4,025,119 | 18 | 497,599 | 35 | 3,150 | 18 | 2,100 | 3 |
| 62 | 72 | 5 | 39,642 | 264,000 | 14,123 | 27,800 | 305,923 | 1 | 11,464 | 9 | 950 | 2 | 300 | 4 |
| 394 | 174 | 19 | 195,703 | 1,131,200 | 62,050 | 74,050 | 1,268,300 | 2 | 33,510 | 12 | 1,225 | ..... | ..... | 5 |
| 215 | 207 | 19 | 93,671 | 330,550 | 65,554 | 34,075 | 430,179 | 2 | 20,082 | 3 | 200 | 20 | 2,100 | 6 |

NEW YORK.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2,269 | 2,216 | 190 | $1,507,395 | $6,443,440 | $1,281,740 | $537,950 | $8,263,130 | 24 | $534,395 | 323 | $39,035 | 48 | $6,880 | |
| 431 | 339 | 43 | 209,228 | 390,000 | 156,500 | 102,000 | 648,500 | 5 | 44,992 | 50 | 4,050 | 1 | 50 | 1 |
| 51 | 30 | 9 | 22,532 | 152,500 | 68,300 | 8,000 | 228,800 | 3 | 21,248 | 41 | 6,500 | ..... | ..... | 2 |
| 227 | 253 | 24 | 164,050 | 913,549 | 150,800 | 54,500 | 1,118,849 | 1 | 59,402 | 112 | 12,985 | 15 | 1,000 | 3 |
| 607 | 788 | 36 | 519,988 | 2,919,525 | 542,120 | 206,100 | 3,667,745 | 4 | 268,084 | 41 | 6,625 | 4 | 230 | 4 |
| 226 | 49 | 14 | 111,780 | 222,000 | 63,000 | 27,000 | 312,000 | 3 | 19,252 | 13 | 1,800 | ..... | ..... | 5 |
| 40 | 170 | 11 | 43,774 | 42,000 | 15,250 | 8,150 | 65,400 | ..... | 8,892 | 13 | 850 | ..... | ..... | 6 |
| 218 | 196 | 13 | 137,210 | 808,500 | 141,700 | 60,500 | 1,010,700 | 6 | 44,144 | 14 | 1,350 | 14 | 2,800 | 7 |
| 232 | 219 | 15 | 168,260 | 568,530 | 54,550 | 28,500 | 651,580 | ..... | 47,050 | 6 | 825 | ..... | ..... | 8 |
| 22 | 16 | 3 | 7,500 | 37,000 | 6,020 | 3,700 | 46,720 | ..... | 1,070 | 8 | 1,100 | 14 | 2,800 | 9 |
| 55 | 23 | 8 | 44,700 | 110,000 | 60,000 | 12,500 | 182,500 | ..... | 10,750 | 3 | 250 | ..... | ..... | 10 |
| 60 | 27 | 5 | 26,000 | 190,000 | 11,500 | 14,000 | 215,500 | 2 | 3,672 | 2 | 200 | ..... | ..... | 11 |
| 100 | 97 | 9 | 52,340 | 89,845 | 12,000 | 13,000 | 114,845 | ..... | 4,630 | 20 | 2,400 | ..... | ..... | 12 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 13 |

TABLE 14.—*Statistics of the production of iron ore, by states and counties*—Continued.

MISSOURI.

| | Counties. | STEAM-POWER. Number of steam-engines. | Value of steam-engines. | Horse-power of steam-engines. | Number of boilers. | Value of boilers. | Horse-power of boilers. | Amount of wood used for fuel. | Value of cord-wood. | Amount of unsawed lumber (other than for fuel). | Value of unsawed lumber. | Amount of sawed lumber. | Value of sawed lumber. | Cost of explosives. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 |
| | | | | | | | | *Cords.* | | *Lin. feet.* | | *Ft. B. M.* | | |
| | The State | 17 | $31,800 | 448 | 24 | $20,150 | 594 | 6,447 | $15,157 | 155,000 | $2,300 | ..... | ..... | $28,972 |
| 1 | Crawford | 4 | 1,900 | 61 | 4 | 1,800 | 70 | 472 | 707 | 5,000 | 50 | ..... | ..... | 7,342 |
| 2 | Dent | 3 | 1,000 | 47 | 3 | 1,550 | 65 | 575 | 1,150 | ..... | ..... | ..... | ..... | 7,043 |
| 3 | Franklin | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 472 |
| 4 | Gasconade | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 112 |
| 5 | Iron | 1 | 8,000 | 80 | 5 | 4,800 | 125 | 400 | 800 | ..... | ..... | ..... | ..... | 7,258 |
| 6 | Phelps | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 150,000 | 2,250 | ..... | ..... | 2,701 |
| 7 | Saint Francois | 9 | 20,000 | 260 | 12 | 12,000 | 325 | 5,000 | 12,500 | ..... | ..... | ..... | ..... | 4,044 |
| 8 | Washington | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

NEW JERSEY.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 152 | $195,945 | 4,486 | 192 | $110,005 | 4,921 | 2 | $8 | 1,007,751 | $43,076 | ..... | ..... | $105,130 |
| 1 | Bergen | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 37 |
| 2 | Hunterdon | 9 | 10,145 | 204 | 11 | 6,050 | 210 | ..... | ..... | 6,000 | 300 | ..... | ..... | 1,980 |
| 3 | Morris | 118 | 155,600 | 3,619 | 143 | 84,905 | 3,821 | ..... | ..... | 904,781 | 37,015 | ..... | ..... | 82,288 |
| 4 | Passaic | 4 | 4,500 | 154 | 5 | 2,500 | 100 | ..... | ..... | 12,000 | 510 | ..... | ..... | 206 |
| 5 | Sussex | 13 | 10,900 | 266 | 17 | 8,190 | 355 | 2 | 8 | 55,970 | 2,601 | ..... | ..... | 15,834 |
| 6 | Warren | 13 | 14,800 | 243 | 16 | 8,300 | 375 | ..... | ..... | 89,000 | 3,460 | ..... | ..... | 4,785 |

NEW YORK.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 87 | $121,501 | 3,039 | 118 | $115,034 | 4,207 | 20,698 | $37,121 | 49,450 | $1,320 | ..... | ..... | $77,093 |
| 1 | Clinton | 11 | 14,850 | 360 | 15 | 11,550 | 405 | 13,700 | 21,250 | 3,000 | 225 | ..... | ..... | 13,200 |
| 2 | Columbia | 5 | 6,275 | 100 | 7 | 8,500 | 260 | 50 | 100 | ..... | ..... | ..... | ..... | 700 |
| 3 | Dutchess | 11 | 15,450 | 365 | 25 | 22,800 | 561 | 8 | 16 | 1,250 | 25 | ..... | ..... | 7,779 |
| 4 | Essex | 25 | 41,300 | 1,340 | 30 | 36,700 | 1,037 | 4,200 | 10,200 | 5,000 | 60 | ..... | ..... | 7,656 |
| 5 | Jefferson | 5 | 5,000 | 185 | 6 | 4,250 | 170 | 1,948 | 4,071 | 10,000 | 100 | ..... | ..... | 3,982 |
| 6 | Oneida | 1 | 2,500 | 45 | 1 | 1,200 | 70 | ..... | ..... | ..... | ..... | ..... | ..... | 6,244 |
| 7 | Orange | 12 | 10,316 | 182 | 12 | 11,384 | 192 | 50 | 100 | 2,700 | 360 | ..... | ..... | 13,708 |
| 8 | Putnam | 8 | 15,300 | 282 | 11 | 12,550 | 415 | 20 | 40 | ..... | ..... | ..... | ..... | 17,008 |
| 9 | Richmond | ..... | ..... | ..... | 1 | 500 | 15 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 10 | Saint Lawrence | 4 | 8,600 | 164 | 5 | 3,900 | 164 | 322 | 544 | 25,000 | 500 | ..... | ..... | 3,153 |
| 11 | Washington | 1 | 500 | 30 | 1 | 500 | 35 | 400 | 800 | 2,500 | 50 | ..... | ..... | 1,960 |
| 12 | Wayne | 4 | 1,500 | 36 | 4 | 1,200 | 43 | ..... | ..... | ..... | ..... | ..... | ..... | 1,703 |
| 13 | Name of county not given | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

TABLE 14.—*Statistics of the production of iron ore, by states and counties*—Continued.

## MISSOURI.

| Value of all machinery. | Value of buildings. | IRREGULAR PRODUCTION. Mined by furnaces. Product, census year. | Value of product. | Value of tools and machinery. | Estimated value of labor in producing and bringing to furnace. | Bought by furnaces. From small mines within the county, census year. | Amount paid for this ore. | Remarks. | |
|---|---|---|---|---|---|---|---|---|---|
| 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | | |
| | | *Tons.* | | | | *Tons.* | | | |
| $131,808 | $8,085 | ..... | ..... | ..... | ..... | ..... | ..... | *Wages* represent net wages. | |
| 6,050 | 1,730 | ..... | ..... | ..... | ..... | ..... | ..... | *Materials* include powder, fuel, lumber, and feed for horses and mules at $5 per head per month. To the total *lumber* (unsawed) should be added 12,000 ties, the value of which is probably included in materials. To the total materials may be added $264 for half-feed of horses and mules during idle time of mines temporarily suspending operations during the census year. | 1 |
| 2,125 | 4,565 | ..... | ..... | ..... | ..... | ..... | ..... | | 2 |
| ..... | 100 | ..... | ..... | ..... | ..... | ..... | ..... | *Furnaces:* The following returns from mines operated by, and in connection with furnaces are probably duplicated by Mr. Swank's returns: Number of mines, 9. Product, 32,734 tons; value, $72,663. Employés, 236; wages, $50,760. Real estate, $120,000; plant, $11,495; working capital, $25,000; total capital, $156,495. | 3 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | 4 |
| 43,233 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | 5 |
| 400 | 1,600 | ..... | ..... | ..... | ..... | ..... | ..... | NOTE.—"The accounts are kept so loosely at almost all the mines of this region that it has been with the utmost difficulty only that anything like a fair return could be made up. | 6 |
| 80,000 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | 7 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | "W. B. POTTER, "*Special Agent, Saint Louis, Missouri.*" | 8 |

## NEW JERSEY.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $519,954 | $15,566 | ..... | ..... | ..... | ..... | ..... | ..... | *Wages* represent the net earnings of the miner. Wherever the wages were manifestly the amount paid to contractor, deductions were made for powder, etc. It is possible, however, that in some cases the "maximum" number of employés and the amount paid to contractor appear as "average" number of employés and net wages, one error serving to conceal the other one. | |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | 1 |
| 20,500 | 750 | ..... | ..... | ..... | ..... | ..... | ..... | *Materials* include explosives, lumber, fuel, etc., and feed for horses and mules, the latter reckoned at $9 per head per month. To total materials should, perhaps, be added $1,824 for half-feed of horses and mules during idle time of mines temporarily suspending operations during census year. | 2 |
| 420,784 | 5,611 | ..... | ..... | ..... | ..... | ..... | ..... | | 3 |
| 9,275 | 500 | ..... | ..... | ..... | ..... | ..... | ..... | | 4 |
| 20,075 | 8,175 | ..... | ..... | ..... | ..... | ..... | ..... | *Explosives*, when not returned and when used, have been estimated at 13 cents per ton. | 5 |
| 40,320 | 530 | ..... | ..... | ..... | ..... | ..... | ..... | *Capital in real estate*, when not returned, has been estimated as equal to the royalty on 6 full years' production at the rate of the monthly production during the census year. | 6 |
| | | | | | | | | *Furnaces:* It is to be feared that most of the ore reported as bought by furnaces from small mines was duplicated, names of middlemen appearing instead of those of operators. In view of this, and the fact that the state was very thoroughly canvassed by Special Agent J. C. Smock, a member of the New Jersey Geological Survey, it was deemed advisable to throw the irregular product out altogether. The mine schedules proper include the following mines, which are operated by and in connection with furnaces. These returns are probably duplicated by Mr. Swank in his returns. Number of mines, 21. Product, census year, 210,113 tons; value, $847,077. Employés, 1,265; wages, $416,884. Capital in real estate, $929,000; plant, $275,000; working capital, $176,250; total capital, $1,380,850. Sussex county product includes 2,500 tons, valued at $10,000, of zinc residues, *i. e.*, Franklinite from which the zinc has been extracted. | |

## NEW YORK.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $634,000 | $30,425 | 200 | $450 | $2,500 | $2,200 | 22,168 | $155,200 | *Capital in real estate*, when not returned, has been estimated as equal to the royalty on six full years' production at the rate of the monthly production during census year. | |
| 52,200 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | *Wages* represent the net earnings of employés. | 1 |
| 31,825 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | *Materials* include powder, lumber, coal or wood for fuel, tools, and feed for horses and mules, etc. To the total materials for the state may be added $2,836 for half-feed of horses and mules during idle time in the case of mines suspending operations temporarily during census year. Feed estimated at $9 per month per head, and added to materials returned. | 2 |
| 81,900 | 3,200 | ..... | ..... | ..... | ..... | ..... | ..... | | 3 |
| 274,836 | ..... | ..... | ..... | ..... | ..... | 863 | 2,425 | | 4 |
| 15,250 | 12,500 | ..... | ..... | ..... | ..... | ..... | ..... | *Furnaces:* Amount of ore bought by furnaces includes that mined within the state and sold to furnaces in neighboring states. Among the mine schedules proper, the following represent mines worked by or in connection with furnaces, and are probably duplicated in Mr. Swank's report: Number of mines, 9. Product, 85,087 tons; value, $214,913. Employés, 357; wages, $100,282. Real estate, $273,540; plant, $142,720; working capital, $53,000; total capital, $470,109. | 5 |
| 6,500 | 6,100 | ..... | ..... | ..... | ..... | ..... | ..... | | 6 |
| 108,875 | 1,425 | ..... | ..... | ..... | ..... | 574 | 1,506 | | 7 |
| 36,020 | 3,500 | ..... | ..... | ..... | ..... | ..... | ..... | | 8 |
| 700 | ..... | ..... | ..... | ..... | ..... | 1,030 | 4,103 | ..... | 9 |
| 20,000 | 3,500 | 200 | 450 | 2,500 | 2,200 | 55 | 165 | ..... | 10 |
| 4,000 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 11 |
| 3,300 | 200 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 12 |
| ..... | ..... | ..... | ..... | ..... | ..... | 19,646 | 147,001 | ..... | 13 |

TABLE 14.—*Statistics of the production of iron ore, by states and counties*—Continued.

NORTH CAROLINA.

| | Counties. | Number of establishments. | Maximum yearly capacity of production. | Product of establishments, census year. | Value of product of establishments. | Total product, census year, i. e., product of establishments and irregular product together. | Value of total product. | EMPLOYÉS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Men employed below ground. | Boys employed below ground. | Men employed above ground. | Boys employed above ground. | Total number of employés. |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | | | *Tons.* | *Tons.* | | *Tons.* | | | | | | |
| | The State | 9 | 11,980 | 3,276 | $5,102 | 3,318 | $5,285 | 19 | ..... | 28 | ..... | 47 |
| 1 | Catawba | 1 | 100 | 50 | 200 | 52 | 208 | 1 | ..... | ..... | ..... | 1 |
| 2 | Cherokee | 4 | 1,300 | 516 | 895 | 516 | 895 | ..... | ..... | 8 | ..... | 8 |
| 3 | Guilford | 1 | 2,500 | 1,080 | 2,250 | 1,080 | 2,250 | 6 | ..... | 9 | ..... | 15 |
| 4 | Lincoln | 1 | 7,000 | 250 | 750 | 250 | 750 | 10 | ..... | 3 | ..... | 13 |
| 5 | Mitchell | 1 | 680 | 680 | 907 | 720 | 1,087 | ..... | ..... | 8 | ..... | 8 |
| 6 | Surry | 1 | 400 | 100 | 100 | 100 | 100 | 2 | ..... | ..... | ..... | 2 |

OREGON.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 1 | 22,400 | 6,972 | $4,069 | 6,972 | $4,069 | 11 | ..... | 3 | ..... | 14 |
| 1 | Clackamas | 1 | 22,400 | 6,972 | 4,069 | 6,972 | 4,069 | 11 | ..... | 3 | ..... | 14 |

OHIO.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 80 | 550,158 | 198,835 | $448,000 | 547,403 | $1,269,530 | 602 | 38 | 1,033 | 43 | 1,716 |
| 1 | Athens | ..... | ..... | ..... | ..... | 17,000 | 34,000 | ..... | ..... | ..... | ..... | ..... |
| 2 | Columbiana | 7 | 122,878 | 46,108 | 87,656 | 56,949 | 110,876 | ..... | ..... | 301 | 10 | 311 |
| 3 | Cuyahoga | ..... | ..... | ..... | ..... | 1,224 | 7,711 | ..... | ..... | ..... | ..... | ..... |
| 4 | Gallia | ..... | ..... | ..... | ..... | 680 | 1,500 | ..... | ..... | ..... | ..... | ..... |
| 5 | Hocking | ..... | ..... | ..... | ..... | 40,740 | 96,840 | ..... | ..... | ..... | ..... | ..... |
| 6 | Jackson | ..... | ..... | ..... | ..... | 73,423 | 193,065 | ..... | ..... | ..... | ..... | ..... |
| 7 | Lawrence | 7 | 106,500 | 62,590 | 177,975 | 136,464 | 338,472 | 335 | ..... | 343 | ..... | 678 |
| 8 | Mahoning | 3 | 22,200 | 19,628 | 34,900 | 20,636 | 42,124 | 74 | 16 | 9 | 1 | 100 |
| 9 | Muskingum | ..... | ..... | ..... | ..... | 8,654 | 20,386 | ..... | ..... | ..... | ..... | ..... |
| 10 | Perry | 2 | 27,000 | 10,767 | 19,047 | 69,373 | 159,551 | ..... | ..... | 117 | ..... | 117 |
| 11 | Scioto | 1 | 5,000 | 1,800 | 3,800 | 17,837 | 47,202 | ..... | ..... | 30 | ..... | 30 |
| 12 | Stark | ..... | ..... | ..... | ..... | 500 | 1,250 | ..... | ..... | ..... | ..... | ..... |
| 13 | Trumbull | 3 | 40,880 | 11,035 | 34,250 | 12,735 | 37,050 | 73 | 7 | 12 | ..... | 92 |
| 14 | Tuscarawas | 6 | 196,700 | 30,388 | 55,272 | 72,388 | 139,272 | 95 | 15 | 111 | 32 | 253 |
| 15 | Vinton | 1 | 35,000 | 17,010 | 35,000 | 18,800 | 39,625 | 25 | ..... | 110 | ..... | 135 |

PENNSYLVANIA.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 358 | 3,408,506 | 1,820,561 | $4,318,999 | 2,185,675 | $5,517,079 | 2,892 | 62 | 5,196 | 583 | 8,733 |
| 1 | Adams | 1 | 5,000 | 560 | 1,375 | 560 | 1,375 | ..... | ..... | 10 | ..... | 10 |
| 2 | Allegheny | ..... | ..... | ..... | ..... | 350 | 1,575 | ..... | ..... | ..... | ..... | ..... |
| 3 | Armstrong | 4 | 26,992 | 11,536 | 20,547 | 31,557 | 76,498 | 87 | ..... | 35 | ..... | 122 |
| 4 | Bedford | 6 | 120,240 | 35,850 | 72,390 | 37,369 | 77,006 | 95 | ..... | 42 | 47 | 184 |
| 5 | Berks | 56 | 555,817 | 252,940 | 681,052 | 304,054 | 875,406 | 522 | 10 | 908 | 112 | 1,612 |
| 6 | Blair | 10 | 184,240 | 154,014 | 394,412 | 154,914 | 394,412 | 161 | 1 | 304 | 21 | 487 |
| 7 | Bucks | 4 | 42,560 | 24,192 | 68,280 | 24,192 | 68,280 | 75 | ..... | 8 | 6 | 89 |
| 8 | Butler | 4 | 6,450 | 2,318 | 5,130 | 2,318 | 5,130 | 17 | ..... | 17 | ..... | 34 |
| 9 | Carbon | ..... | ..... | ..... | ..... | 852 | 3,067 | ..... | ..... | ..... | ..... | ..... |
| 10 | Centre | 1 | 11,200 | 4,875 | 10,883 | 8,935 | 25,399 | ..... | ..... | 40 | ..... | 40 |

TABLE 14.—*Statistics of the production of iron ore, by states and counties*—Continued.

NORTH CAROLINA.

| EMPLOYÉS. | | | | CAPITAL. | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of miners. | Number of laborers. | Number of administrative force. | Total wages paid. | Value of real estate. | Value of plant. | Amount used as working capital. | Total capital employed and invested. | Number of mining company's stores. | Value of all materials used. | Number of horses. | Value of horses. | Number of mules. | Value of mules. | |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | |
| 38 | 4 | 5 | $4,059 | $8,050 | $2,750 | $1,000 | $13,300 | 1 | $965 | ..... | ..... | 2 | $200 | |
| 1 | ..... | ..... | 75 | 100 | 100 | ..... | 200 | ..... | 55 | ..... | ..... | ..... | ..... | 1 |
| 8 | ..... | ..... | 361 | 4,250 | ..... | 100 | 4,350 | ..... | 20 | ..... | ..... | ..... | ..... | 2 |
| 14 | ..... | 1 | 1,000 | 2,300 | 1,500 | 1,200 | 5,000 | ..... | 680 | ..... | ..... | 2 | 200 | 3 |
| 10 | ..... | 3 | 1,170 | 400 | 1,000 | 500 | 1,900 | ..... | 150 | ..... | ..... | ..... | ..... | 4 |
| 3 | 4 | 1 | 708 | 1,000 | 50 | 50 | 1,100 | 1 | 50 | ..... | ..... | ..... | ..... | 5 |
| 2 | ..... | ..... | 85 | 600 | 100 | 50 | 750 | ..... | 10 | ..... | ..... | ..... | ..... | 6 |

OREGON.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 2 | 1 | $2,210 | $9,750 | $5,000 | $2,225 | $16,975 | ..... | $600 | ..... | ..... | ..... | ..... | |
| 11 | 2 | 1 | 2,210 | 9,750 | 5,000 | 2,225 | 16,975 | ..... | 600 | ..... | ..... | ..... | ..... | 1 |

OHIO.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,218 | 450 | 44 | $320,723 | $857,401 | $263,145 | $128,170 | $1,248,725 | 8 | $23,300 | 35 | $3,500 | 55 | $5,125 | |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 |
| 231 | 67 | 13 | 56,153 | 20,175 | 6,020 | 10,300 | 37,395 | ..... | 1,250 | ..... | ..... | ..... | ..... | 2 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 5 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 6 |
| 513 | 158 | 7 | 137,019 | 567,800 | 197,575 | 53,000 | 818,375 | 5 | 11,470 | 27 | 2,700 | 28 | 2,800 | 7 |
| 87 | 11 | 2 | 25,859 | 9,450 | 7,950 | 4,250 | 21,650 | ..... | 3,960 | ..... | ..... | 9 | 725 | 8 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 9 |
| 110 | 7 | ..... | 15,635 | 91,726 | 3,500 | 4,329 | 99,555 | 2 | 1,164 | 6 | 600 | ..... | ..... | 10 |
| 30 | ..... | ..... | 3,300 | 50,000 | 9,000 | 6,500 | 65,500 | 1 | 1,000 | ..... | ..... | ..... | ..... | 11 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 12 |
| 74 | 13 | 5 | 20,482 | 13,000 | 16,200 | 6,100 | 35,300 | ..... | 1,983 | 1 | 100 | 5 | 550 | 13 |
| 143 | 103 | 7 | 20,275 | 75,250 | 20,000 | 23,700 | 118,950 | ..... | 2,120 | 1 | ..... | 13 | 1,050 | 14 |
| 25 | 100 | 10 | 33,000 | 30,000 | 2,000 | 20,000 | 52,000 | ..... | 850 | ..... | ..... | ..... | ..... | 15 |

PENNSYLVANIA.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4,717 | 3,630 | 386 | $2,192,167 | $14,759,804 | $2,131,743 | $730,064 | $17,621,701 | 39 | $525,165 | 1,327 | $117,717 | 309 | $32,755 | |
| 7 | 2 | 1 | 400 | 5,000 | 6,000 | 500 | 11,500 | ..... | 94 | ..... | ..... | ..... | ..... | 1 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2 |
| 107 | 13 | 2 | 14,948 | 38,385 | 1,200 | 2,730 | 42,315 | 1 | 882 | 2 | 200 | 3 | 300 | 3 |
| 141 | 36 | 7 | 58,497 | 250,000 | 56,100 | 10,850 | 325,950 | ..... | 11,045 | 10 | 960 | 15 | 1,525 | 4 |
| 708 | 825 | 70 | 394,335 | 774,979 | 487,366 | 126,522 | 1,388,867 | 3 | 124,124 | 261 | 24,347 | 36 | 3,800 | 5 |
| 156 | 314 | 17 | 171,631 | 431,000 | 108,535 | 48,400 | 587,935 | 5 | 47,863 | 55 | 6,050 | 46 | 5,350 | 6 |
| 43 | 42 | 4 | 23,145 | 80,000 | 5,350 | 1,500 | 87,350 | ..... | 4,746 | 3 | 250 | ..... | ..... | 7 |
| 27 | 6 | 1 | 3,672 | 7,200 | 400 | 1,050 | 8,650 | ..... | 420 | 4 | 250 | ..... | ..... | 8 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 9 |
| ..... | 36 | 4 | 10,660 | 40,000 | 12,000 | 3,000 | 55,000 | 1 | 2,590 | ..... | ..... | 2 | 250 | 10 |

TABLE 14.—*Statistics of the production of iron ore, by states and counties*—Continued.

NORTH CAROLINA.

| | Countries. | STEAM-POWER. Number of steam-engines. | Value of steam-engines. | Horse-power of steam-engines. | Number of boilers. | Value of boilers. | Horse-power of boilers. | Amount of wood used for fuel. | Value of cord-wood. | Amount of unsawed lumber (other than for fuel). | Value of unsawed lumber. | Amount of sawed lumber. | Value of sawed lumber. | Cost of explosives. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 |
| | | | | | | | | *Cords.* | | *Lin. feet.* | | *Ft. B. M.* | | |
| | The State | 2 | $800 | 20 | 2 | $550 | 20 | 30 | $75 | 250 | $5 | ..... | ..... | $72 |
| 1 | Catawba | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 50 |
| 2 | Cherokee | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 5 |
| 3 | Guilford | 1 | 400 | 9 | 1 | 400 | 9 | ..... | ..... | ..... | ..... | ..... | ..... | 17 |
| 4 | Lincoln | 1 | 400 | 20 | 1 | 150 | 20 | 30 | 75 | ..... | ..... | ..... | ..... | ..... |
| 5 | Mitchell | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 6 | Surry | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 250 | 5 | ..... | ..... | ..... |

OREGON.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 1 | $500 | 16 | 1 | $500 | 16 | 52 | $104 | ..... | $304 | ..... | ..... | $236 |
| 1 | Clackamas | 1 | 500 | 16 | 1 | 500 | 16 | 52 | 104 | ..... | 304 | ..... | ..... | 236 |

OHIO.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 5 | $4,925 | 130 | 13 | $3,375 | 180 | ..... | ..... | 155,000 | $1,900 | ..... | ..... | $7,948 |
| 1 | Athens | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 2 | Columbiana | 1 | 225 | 25 | 3 | 725 | 35 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 3 | Cuyahoga | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 4 | Gallia | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 5 | Hocking | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 6 | Jackson | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 7 | Lawrence | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 5,987 |
| 8 | Mahoning | 3 | 3,500 | 85 | 8 | 2,000 | 90 | ..... | ..... | 120,000 | 1,200 | ..... | ..... | 600 |
| 9 | Muskingum | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 10 | Perry | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 500 |
| 11 | Scioto | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 12 | Stark | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 13 | Trumbull | 1 | 1,200 | 20 | 2 | 650 | 55 | ..... | ..... | 25,000 | 200 | ..... | ..... | 278 |
| 14 | Tuscarawas | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10,000 | 500 | ..... | ..... | 484 |
| 15 | Vinton | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

PENNSYLVANIA.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 380 | $451,396 | 9,117 | 559 | $246,080 | 10,864 | 595 | $1,483 | 1,208,092 | $29,840 | ..... | ..... | $65,288 |
| 1 | Adams | 1 | 800 | 25 | 1 | 1,000 | 30 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 2 | Allegheny | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 3 | Armstrong | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 509 |
| 4 | Bedford | 1 | 2,000 | 50 | 1 | 500 | 50 | ..... | ..... | 354,500 | 5,575 | ..... | ..... | 1,775 |
| 5 | Berks | 97 | 127,520 | 2,737 | 148 | 69,550 | 3,064 | ..... | ..... | 108,250 | 7,220 | ..... | ..... | 12,174 |
| 6 | Blair | 13 | 16,900 | 624 | 17 | 14,200 | 800 | ..... | ..... | 6,926 | 352 | ..... | ..... | 7,140 |
| 7 | Bucks | 2 | 1,500 | 45 | 3 | 800 | 50 | ..... | ..... | 20,000 | 100 | ..... | ..... | 2,932 |
| 8 | Butler | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 400 | 8 | ..... | ..... | 117 |
| 9 | Carbon | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 10 | Centre | 3 | 2,000 | 90 | 5 | 2,000 | 100 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

TABLE 14.—*Statistics of the production of iron ore, by states and counties*—Continued.

NORTH CAROLINA.

| Value of all machinery. | Value of buildings. | IRREGULAR PRODUCTION. Mined by furnaces. Product, census year. | Value of product. | Value of tools and machinery. | Estimated value of labor in producing and bringing to furnace. | Bought by furnaces. From small mines within the county, census year. | Amount paid for this ore. | Remarks. | |
|---|---|---|---|---|---|---|---|---|---|
| 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | | |
| | | *Tons.* | | | | *Tons.* | | | |
| $1,850 | $50 | 41 | $183 | ..... | $182 | ..... | ..... | | |
| 50 | 50 | 1 | 3 | ..... | 2 | ..... | ..... | *Capital in real estate*, when not returned, has been estimated as equal to the royalty (25 cents a ton) for six full years at the rate of the production during the census year. | 1 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | 2 |
| 800 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | *Materials* include powder, fuel, lumber, and feed, the latter at the rate of $5 per head per working month. | 3 |
| 1,000 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | 4 |
| ..... | ..... | 40 | 180 | ..... | 180 | ..... | ..... | | 5 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | 6 |

OREGON.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $1,000 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | |
| 1,000 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Buildings and machinery are worth $5,000. | 1 |

OHIO.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $8,600 | $20,125 | 284,808 | $651,940 | ..... | ..... | 63,700 | $169,581 | | |
| ..... | ..... | 17,000 | 34,000 | ..... | ..... | ..... | ..... | *Product of mines operated by furnaces:* Among the mine schedules proper there are 10 mines operated by and in connection with furnaces. The total production of these mines during the census year is 74,666 tons; value of same, $200,522. Number of employés, 825; wages, $155,954. Value of real estate, $702,520; plant, $210,075; working capital, $63,029; total capital, $983,430. These amounts are probably duplicated in Mr. Swank's report. | 1 |
| 1,050 | ..... | ..... | ..... | ..... | ..... | 10,841 | 23,220 | | 2 |
| ..... | ..... | ..... | ..... | ..... | ..... | 1,224 | 7,711 | | 3 |
| ..... | ..... | 680 | 1,500 | ..... | ..... | ..... | ..... | | 4 |
| ..... | ..... | 35,142 | 81,326 | ..... | ..... | 5,598 | 15,520 | *Materials* include feed at $5 per head per month, and powder, lumber, etc. To total materials may be added for half-feed in idle time, $572 50. Wages are probably gross as a rule, it being difficult to arrive at the exact outlay of miners for tools, etc. | 5 |
| ..... | ..... | 47,157 | 117,883 | ..... | ..... | 20,266 | 75,182 | | 6 |
| ..... | 27,000 | 72,973 | 157,173 | ..... | ..... | 892 | 3,324 | | 7 |
| 4,000 | 1,300 | 112 | 224 | ..... | ..... | 896 | 7,000 | | 8 |
| ..... | ..... | 8,054 | 20,386 | ..... | ..... | ..... | ..... | | 9 |
| ..... | ..... | 42,723 | 107,180 | ..... | ..... | 15,883 | 32,724 | | 10 |
| ..... | ..... | 16,537 | 43,902 | ..... | ..... | ..... | ..... | | 11 |
| ..... | ..... | 500 | 1,250 | ..... | ..... | ..... | ..... | | 12 |
| 3,550 | 825 | 300 | 600 | ..... | ..... | 1,400 | 2,800 | | 13 |
| ..... | ..... | 42,000 | 84,000 | ..... | ..... | ..... | ..... | | 14 |
| ..... | ..... | 1,000 | 2,525 | ..... | ..... | 700 | 2,100 | | 15 |

PENNSYLVANIA.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $934,058 | $307,182 | 100,957 | $318,953 | $101,731 | $224,077 | 264,157 | $879,127 | *Product of mines operated by furnaces:* Among the "mine schedules" proper there are 125 mines operated by and in connection with furnaces. The aggregate production of such mines is 706,339 tons, valued at $1,672,024. The total number of employés in the same is 4,194. The total amount of wages paid is $1,134,374. The capital, real and personal: Real, $3,149,183; plant, $828,678; working, $364,580; total capital, $4,342,441. These amounts are probably duplicated in Mr. Swank's report. | |
| 2,100 | 800 | ..... | ..... | ..... | ..... | ..... | ..... | | 1 |
| ..... | ..... | ..... | ..... | ..... | ..... | 350 | 1,575 | | 2 |
| ..... | ..... | ..... | ..... | ..... | ..... | 20,021 | 55,951 | | 3 |
| 7,000 | 2,200 | ..... | ..... | ..... | ..... | 1,519 | 4,016 | *Capital in real estate:* When no return or estimate could be obtained from the operator or owner the value has been estimated by the revisers as equal to the sum of the royalty on the product of six full years, calculated from the average monthly production of the census year. | 4 |
| 260,068 | 61,348 | 14,812 | 56,551 | 13,000 | 54,018 | 37,202 | 137,863 | | 5 |
| 42,370 | 14,800 | ..... | ..... | ..... | ..... | ..... | ..... | *Wages* represent net earnings of employés. | 6 |
| 2,800 | 750 | ..... | ..... | ..... | ..... | ..... | ..... | *Materials* include coal, powder, fuse, lumber, oil, iron, rails, etc., and feed for horses and mules. The latter has been estimated at $7 per head per working month. To the total materials should be added for half-feed of animals during idle time of mines $8,146. | 7 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | 8 |
| ..... | ..... | ..... | ..... | ..... | ..... | 852 | 3,067 | | 9 |
| 10,000 | 600 | 4,004 | 14,303 | 6,000 | 10,726 | 56 | 213 | | 10 |

TABLE 14.—*Statistics of the production of iron ore, by states and counties*—Continued.

PENNSYLVANIA—Continued.

| | Counties. | Number of establishments. | Maximum yearly capacity of production. | Product of establishments, census year. | Value of product of establishments. | Total product, census year, *i. e.*, product of establishments and irregular product together. | Value of total product. | EMPLOYÉS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Men employed below ground. | Boys employed below ground. | Men employed above ground. | Boys employed above ground. | Total number of employés. |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | | | *Tons.* | *Tons.* | | *Tons.* | | | | | | |
| 11 | Chester | 5 | 24,452 | 10,687 | 31,309 | 14,687 | 40,801 | 50 | ..... | 48 | 9 | 107 |
| 12 | Clarion | 11 | 59,480 | 15,360 | 28,798 | 15,705 | 30,142 | 114 | ..... | 74 | ..... | 188 |
| 13 | Columbia | ..... | ..... | ..... | ..... | 22,588 | 75,788 | ..... | ..... | ..... | ..... | ..... |
| 14 | Cumberland | 19 | 218,500 | 67,846 | 151,972 | 76,338 | 180,617 | 15 | ..... | 447 | 22 | 484 |
| 15 | Dauphin | 2 | 9,480 | 2,016 | 3,600 | 3,132 | 7,918 | ..... | ..... | 26 | 5 | 31 |
| 16 | Fayette | 4 | 109,186 | 63,702 | 147,601 | 76,140 | 183,433 | 272 | 9 | 84 | 4 | 369 |
| 17 | Franklin | 11 | 92,602 | 34,458 | 86,098 | 36,614 | 92,076 | 31 | 10 | 201 | 25 | 267 |
| 18 | Huntingdon | 4 | 68,320 | 25,245 | 61,407 | 26,113 | 65,736 | 50 | ..... | 46 | 7 | 103 |
| 19 | Juniata | 7 | 57,234 | 34,378 | 60,835 | 35,720 | 73,923 | 70 | ..... | 38 | ..... | 108 |
| 20 | Lancaster | 9 | 102,704 | 63,274 | 134,583 | 78,850 | 184,919 | ..... | ..... | 241 | 28 | 269 |
| 21 | Lawrence | 16 | 187,330 | 60,201 | 123,226 | 70,206 | 153,546 | 158 | 6 | 66 | ..... | 230 |
| 22 | Lebanon | 4 | 207,102 | 285,620 | 514,320 | 285,620 | 514,320 | ..... | ..... | 184 | 14 | 198 |
| 23 | Lehigh | 66 | 524,604 | 321,322 | 880,818 | 419,700 | 1,201,020 | 217 | ..... | 1,434 | 196 | 1,847 |
| 24 | Lycoming | 3 | 14,224 | 4,948 | 6,988 | 5,374 | 8,479 | 33 | ..... | 12 | ..... | 45 |
| 25 | Mercer | ..... | ..... | ..... | ..... | 1,008 | 7,200 | ..... | ..... | ..... | ..... | ..... |
| 26 | Mifflin | 15 | 70,805 | 34,152 | 70,194 | 53,690 | 119,800 | 120 | 4 | 82 | 3 | 218 |
| 27 | Montgomery | 15 | 62,832 | 41,881 | 92,247 | 94,987 | 208,738 | 103 | ..... | 110 | 10 | 223 |
| 28 | Montour | 3 | 63,440 | 30,741 | 47,077 | 33,890 | 58,400 | 133 | 13 | 8 | 3 | 157 |
| 29 | Northampton | 35 | 144,799 | 104,788 | 267,161 | 122,526 | 327,068 | 140 | ..... | 282 | 40 | 462 |
| 30 | Northumberland | 2 | 17,360 | 2,016 | 4,600 | 6,142 | 16,728 | 16 | ..... | 8 | ..... | 24 |
| 31 | Perry | 10 | 59,838 | 39,153 | 107,109 | 39,384 | 107,986 | 134 | 5 | 82 | 21 | 242 |
| 32 | Snyder | 7 | 95,648 | 27,381 | 54,904 | 31,426 | 68,066 | 118 | ..... | 29 | ..... | 147 |
| 33 | Tioga | ..... | ..... | ..... | ..... | 100 | 250 | ..... | ..... | ..... | ..... | ..... |
| 34 | Union | 1 | 2,000 | 529 | 1,062 | 809 | 1,803 | 8 | ..... | 6 | ..... | 14 |
| 35 | York | 18 | 173,511 | 63,570 | 178,422 | 70,058 | 199,120 | 144 | 4 | 264 | 10 | 422 |

TENNESSEE.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 34 | 218,254 | 89,933 | $120,951 | 104,405 | $147,181 | 77 | ..... | 443 | 32 | 552 |
| 1 | Blount | 1 | 5,070 | 2,342 | 3,098 | 2,342 | 3,098 | 4 | ..... | 7 | ..... | 11 |
| 2 | Bradley | 3 | 25,081 | 9,931 | 12,625 | 9,931 | 12,625 | ..... | ..... | 71 | ..... | 71 |
| 3 | Carter | 5 | 5,934 | 4,445 | 10,131 | 4,445 | 10,131 | ..... | ..... | 36 | ..... | 36 |
| 4 | Dixon | 2 | 12,474 | 10,773 | 18,892 | 10,773 | 18,892 | ..... | ..... | 83 | 15 | 98 |
| 5 | Hamblin | 1 | 11,200 | 5,600 | 15,000 | 5,600 | 15,000 | ..... | ..... | 35 | 5 | 40 |
| 6 | James | 5 | 29,305 | 13,235 | 15,125 | 13,235 | 15,125 | ..... | ..... | 73 | 2 | 75 |
| 7 | Johnson | 10 | 6,790 | 3,060 | 3,260 | 3,060 | 3,260 | 5 | ..... | 35 | ..... | 40 |
| 8 | Lawrence | 1 | 11,340 | 641 | 565 | 641 | 565 | ..... | ..... | 25 | ..... | 25 |
| 9 | Meigs | 1 | 11,340 | 10,206 | 13,500 | 10,206 | 13,500 | 15 | ..... | 7 | ..... | 22 |
| 10 | Rhea | 1 | 34,020 | 13,608 | 18,000 | 13,608 | 18,000 | 30 | ..... | 8 | ..... | 38 |
| 11 | Roane | 3 | 38,220 | 15,049 | 18,126 | 29,581 | 35,356 | 23 | ..... | 43 | 5 | 71 |
| 12 | Stewart | 1 | 26,880 | 1,043 | 1,620 | 1,043 | 1,620 | ..... | ..... | 20 | 5 | 25 |

TEXAS.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | ..... | ..... | ..... | ..... | 3,600 | $8,100 | ..... | ..... | ..... | ..... | ..... |
| 1 | Marion | ..... | ..... | ..... | ..... | 3,600 | 8,100 | ..... | ..... | ..... | ..... | ..... |

TABLE 14.—*Statistics of the production of iron ore, by states and counties*—Continued.

PENNSYLVANIA—Continued.

| EMPLOYÉS. | | | | CAPITAL. | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of miners. | Number of laborers. | Number of administrative force. | Total wages paid. | Value of real estate. | Value of plant. | Amount used as working capital. | Total capital employed and invested. | Number of mining company's stores. | Value of all materials used. | Number of horses. | Value of horses. | Number of mules. | Value of mules. | |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | |
| 35 | 67 | 5 | 20,463 | 10,000 | 20,075 | 7,400 | 47,075 | ..... | 11,205 | 18 | 1,575 | ..... | ..... | 11 |
| 166 | 16 | 6 | 22,982 | 77,456 | 5,120 | 5,705 | 88,281 | 2 | 1,542 | 10 | 825 | 11 | 1,000 | 12 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 13 |
| 321 | 143 | 20 | 65,023 | 336,633 | 143,023 | 37,933 | 517,589 | 2 | 22,530 | 52 | 3,780 | 15 | 1,475 | 14 |
| 2 | 28 | 1 | 2,638 | 20,000 | 3,500 | 3,000 | 26,500 | ..... | 900 | 10 | 1,000 | ..... | ..... | 15 |
| 277 | 84 | 8 | 131,806 | 411,000 | 33,000 | 25,000 | 469,000 | 2 | 20,318 | 11 | 895 | 44 | 4,250 | 16 |
| 107 | 86 | 14 | 49,458 | 86,766 | 56,633 | 22,666 | 166,065 | 4 | 11,795 | 41 | 2,640 | 13 | 1,260 | 17 |
| 44 | 51 | 8 | 30,307 | 1,140,000 | 58,779 | 20,000 | 1,218,779 | 3 | 8,224 | 18 | 1,350 | 10 | 1,000 | 18 |
| 60 | 44 | 4 | 32,209 | 38,000 | 6,000 | 6,700 | 50,700 | ..... | 3,092 | 6 | 450 | 20 | 1,805 | 19 |
| 114 | 141 | 17 | 61,563 | 289,000 | 54,450 | 15,820 | 359,270 | ..... | 14,268 | 42 | 3,750 | 16 | 1,410 | 20 |
| 103 | 54 | 13 | 66,156 | 130,000 | 8,000 | 14,000 | 153,500 | 4 | 6,704 | 17 | 1,305 | 6 | 600 | 21 |
| 27 | 162 | 9 | 48,459 | 8,017,500 | 210,000 | 102,650 | 8,330,150 | ..... | 14,526 | 6 | 300 | ..... | ..... | 22 |
| 991 | 783 | 73 | 422,008 | 1,064,887 | 498,400 | 149,042 | 1,712,329 | ..... | 131,206 | 462 | 40,775 | 19 | 3,350 | 23 |
| 30 | 12 | 3 | 9,718 | 8,200 | 3,686 | 5,320 | 17,206 | ..... | 2,934 | 16 | 2,750 | ..... | ..... | 24 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 25 |
| 155 | 47 | 16 | 37,818 | 58,350 | 39,510 | 8,696 | 106,556 | 5 | 5,806 | 26 | 2,400 | 3 | 110 | 26 |
| 78 | 137 | 8 | 54,632 | 220,200 | 25,050 | 12,000 | 203,850 | ..... | 11,280 | 38 | 3,305 | 1 | 100 | 27 |
| 137 | 13 | 7 | 55,046 | 112,555 | 47,507 | 17,240 | 177,302 | 5 | 8,516 | 3 | 325 | 3 | 85 | 28 |
| 231 | 203 | 28 | 150,008 | 264,618 | 96,421 | 27,030 | 388,069 | ..... | 31,051 | 132 | 640 | ..... | ..... | 29 |
| 16 | 7 | 1 | 2,334 | 24,445 | 488 | 1,300 | 26,233 | ..... | 177 | ..... | ..... | ..... | ..... | 30 |
| 185 | 45 | 12 | 81,502 | 535,500 | 27,200 | 27,125 | 589,825 | 1 | 5,901 | 9 | 640 | 28 | 3,350 | 31 |
| 116 | 28 | 3 | 32,441 | 57,220 | 10,975 | 5,200 | 73,455 | ..... | 4,604 | 22 | 2,055 | 11 | 960 | 32 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 33 |
| 8 | 5 | 1 | 435 | 1,000 | 600 | 150 | 1,750 | 1 | 162 | 7 | 525 | ..... | ..... | 34 |
| 205 | 200 | 17 | 88,073 | 206,000 | 103,775 | 20,875 | 330,650 | ..... | 16,510 | 46 | 4,400 | 7 | 775 | 35 |

TENNESSEE.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 410 | 109 | 24 | $83,529 | $410,450 | $36,005 | $27,375 | $473,920 | 14 | $8,079 | 22 | $1,600 | 84 | $10,100 | |
| 10 | ..... | 1 | 6,450 | ..... | 1,000 | 1,000 | 2,000 | ..... | 200 | ..... | ..... | 2 | 200 | 1 |
| 66 | 2 | 3 | 7,480 | 12,300 | 1,000 | 5,600 | 19,800 | 1 | 310 | 2 | 200 | 6 | 600 | 2 |
| 22 | 14 | ..... | 6,800 | 8,800 | 1,425 | 1,400 | 11,625 | 1 | 1,040 | 10 | 900 | ..... | ..... | 3 |
| 95 | ..... | 3 | 16,631 | 65,000 | 5,000 | 4,000 | 74,000 | 2 | 885 | ..... | ..... | 16 | 2,000 | 4 |
| 80 | 9 | 1 | 5,500 | 10,000 | 500 | 500 | 11,000 | ..... | 716 | 6 | 200 | ..... | ..... | 5 |
| 59 | 11 | 5 | 9,125 | 25,950 | 3,670 | 2,850 | 32,470 | 3 | 2,343 | 4 | 300 | 22 | 2,500 | 6 |
| 28 | 17 | ..... | 2,042 | 11,000 | 2,100 | 1,325 | 15,325 | 1 | 377 | ..... | ..... | ..... | ..... | 7 |
| 20 | 5 | ..... | 1,100 | 17,500 | 3,000 | 500 | 21,000 | 1 | 150 | ..... | ..... | 10 | 1,500 | 8 |
| 8 | 12 | 2 | 5,000 | 7,000 | 2,000 | 1,000 | 10,000 | 1 | 300 | ..... | ..... | 3 | 300 | 9 |
| 15 | 20 | 3 | 9,000 | 30,000 | 7,000 | 3,000 | 40,000 | 1 | 1,000 | ..... | ..... | 7 | 900 | 10 |
| 53 | 14 | 4 | 12,301 | 38,000 | 6,500 | 5,200 | 49,700 | 3 | 650 | ..... | ..... | 12 | 1,200 | 11 |
| 18 | 5 | 2 | 1,500 | 134,000 | 2,000 | 1,000 | 137,000 | ..... | 708 | ..... | ..... | 6 | 900 | 12 |

TEXAS.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 |

TABLE 14.—*Statistics of the production of iron ore, by states and counties*—Continued.

PENNSYLVANIA—Continued.

| | Counties. | STEAM-POWER. Number of steam-engines. | Value of steam-engines. | Horse-power of steam-engines. | Number of boilers. | Value of boilers. | Horse-power of boilers. | Amount of wood used for fuel. | Value of cord-wood. | Amount of unsawed lumber (other than for fuel). | Value of unsawed lumber. | Amount of sawed lumber. | Value of sawed lumber. | Cost of explosives. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 |
| | | | | | | | | *Cords.* | | *Lin. feet.* | | *Ft. B. M.* | | |
| 11 | Chester | 9 | 7,500 | 170 | 11 | 4,800 | 201 | ..... | ..... | 6,000 | 240 | ..... | ..... | 918 |
| 12 | Clarion | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8,000 | 172 | ..... | ..... | 232 |
| 13 | Columbia | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 14 | Cumberland | 26 | 26,400 | 540 | 25 | 10,250 | 509 | 231 | 407 | 4,800 | 220 | ..... | ..... | 733 |
| 15 | Dauphin | 2 | 900 | 25 | 2 | 400 | 25 | ..... | ..... | ..... | ..... | ..... | ..... | 12 |
| 16 | Fayette | 1 | 400 | 20 | 1 | 160 | 30 | ..... | ..... | ..... | ..... | ..... | ..... | 7,191 |
| 17 | Franklin | 13 | 14,500 | 283 | 15 | 8,550 | 337 | 348 | 1,044 | 2,800 | 52 | ..... | ..... | 230 |
| 18 | Huntingdon | 2 | 2,000 | 80 | 3 | 1,500 | 100 | 6 | 12 | 54,500 | 1,025 | ..... | ..... | 505 |
| 19 | Juniata | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3,575 | 220 | ..... | ..... | 328 |
| 20 | Lancaster | 19 | 23,050 | 485 | 22 | 7,800 | 450 | ..... | ..... | 500 | 20 | ..... | ..... | 100 |
| 21 | Lawrence | ..... | ..... | ..... | ..... | ..... | ..... | 10 | 20 | 3,800 | 56 | ..... | ..... | 1,085 |
| 22 | Lebanon | 3 | 2,450 | 82 | 6 | 1,650 | 105 | ..... | ..... | ..... | ..... | ..... | ..... | 5,814 |
| 23 | Lehigh | 124 | 158,626 | 2,574 | 204 | 85,900 | 3,370 | ..... | ..... | 148,550 | 8,880 | ..... | ..... | 13,513 |
| 24 | Lycoming | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 12,500 | 500 | ..... | ..... | 634 |
| 25 | Mercer | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 26 | Mifflin | 5 | 9,000 | 63 | 5 | 1,350 | 75 | ..... | ..... | 142,500 | 1,200 | ..... | ..... | 1,221 |
| 27 | Montgomery | 6 | 6,850 | 179 | 9 | 3,050 | 179 | ..... | ..... | 20,416 | 425 | ..... | ..... | 37 |
| 28 | Montour | 4 | 6,000 | 235 | 13 | 5,100 | 240 | ..... | ..... | 7,000 | 315 | ..... | ..... | 4,388 |
| 29 | Northampton | 28 | 28,050 | 421 | 43 | 16,020 | 617 | ..... | ..... | 213,775 | 2,220 | ..... | ..... | 68 |
| 30 | Northumberland | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 31 | Perry | 3 | 3,000 | 75 | 4 | 1,500 | 74 | ..... | ..... | 61,000 | 820 | ..... | ..... | 369 |
| 32 | Snyder | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 19,000 | 88 | ..... | ..... | 400 |
| 33 | Tioga | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 34 | Union | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 120 | 5 | ..... | ..... | 10 |
| 35 | York | 18 | 11,050 | 308 | 21 | 8,500 | 389 | ..... | ..... | 8,580 | 118 | ..... | ..... | 1,953 |

TENNESSEE.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 18,000 | $000 | ..... | ..... | $1,209 |
| 1 | Blount | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2,000 | 100 | ..... | ..... | ..... |
| 2 | Bradley | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 |
| 3 | Carter | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 4 | Dixon | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 360 |
| 5 | Hamblin | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 6 | James | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 791 |
| 7 | Johnson | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 8 | Lawrence | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 9 | Meigs | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4,000 | 200 | ..... | ..... | ..... |
| 10 | Rhea | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10,000 | 500 | ..... | ..... | ..... |
| 11 | Roane | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2,000 | 100 | ..... | ..... | 38 |
| 12 | Stewart | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 |

TEXAS.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 1 | Marion | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

TABLE 14.—*Statistics of the production of iron ore, by states and counties*—Continued.

PENNSYLVANIA—Continued.

| Value of all machinery. | Value of buildings. | IRREGULAR PRODUCTION. Mined by furnaces. Product, census year. | Value of product. | Value of tools and machinery. | Estimated value of labor in producing and bringing to furnace. | Bought by furnaces. From small mines within the county, census year. | Amount paid for this ore. | Remarks. | |
|---|---|---|---|---|---|---|---|---|---|
| 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | | |
| | | *Tons.* | | | | *Tons.* | | | |
| 15,000 | 1,300 | ..... | ..... | ..... | ..... | 3,350 | 9,402 | *Cambria county:* The only iron mines in this county are those of the Cambria Iron Company, which produce ordinarily about 30,000 tons (carbonate) per annum, but which were idle during the census year. | 11 |
| ..... | ..... | ..... | ..... | ..... | ..... | 336 | 1,344 | | 12 |
| ..... | ..... | 22,588 | 75,788 | 41,500 | 62,045 | ..... | ..... | | 13 |
| 52,933 | 18,116 | 4,400 | 13,200 | 4,400 | 10,000 | 4,092 | 15,445 | | 14 |
| 1,800 | 2,000 | 1,060 | 4,248 | 500 | 2,385 | 56 | 65 | | 15 |
| ..... | ..... | ..... | ..... | ..... | ..... | 12,348 | 35,742 | | 16 |
| 29,000 | 14,049 | ..... | ..... | ..... | ..... | 2,150 | 5,078 | | 17 |
| 13,200 | 4,700 | ..... | ..... | ..... | ..... | 868 | 4,329 | | 18 |
| ..... | 200 | ..... | ..... | ..... | ..... | 1,351 | 4,088 | | 19 |
| 34,700 | 4,850 | 5,052 | 11,843 | 6,700 | 9,000 | 10,524 | 38,493 | | 20 |
| 2,000 | ..... | ..... | ..... | ..... | ..... | 10,005 | 30,320 | | 21 |
| 18,000 | 550 | ..... | ..... | ..... | ..... | ..... | ..... | | 22 |
| 311,870 | 138,378 | 20,803 | 62,670 | 10,000 | 41,780 | 77,485 | 258,432 | | 23 |
| ..... | 600 | ..... | ..... | ..... | ..... | 426 | 1,491 | | 24 |
| ..... | ..... | ..... | ..... | ..... | ..... | 1,008 | 7,200 | | 25 |
| 12,975 | 900 | 17,860 | 44,650 | 2,536 | 4,000 | 1,687 | 4,956 | | 26 |
| 13,500 | 4,700 | 6,008 | 22,530 | 9,500 | 10,512 | 40,498 | 153,961 | | 27 |
| 12,000 | 2,800 | ..... | ..... | ..... | ..... | 3,140 | 10,723 | | 28 |
| 61,110 | 12,301 | 732 | 2,708 | ..... | 1,790 | 17,000 | 57,109 | | 29 |
| ..... | ..... | 3,448 | 10,122 | 95 | 3,050 | 678 | 2,00 | | 30 |
| 6,100 | 6,880 | ..... | ..... | ..... | ..... | 231 | 877 | | 31 |
| ..... | 1,000 | ..... | ..... | ..... | ..... | 4,045 | 13,162 | | 32 |
| ..... | ..... | 100 | 250 | 7,500 | 150 | ..... | ..... | | 33 |
| ..... | ..... | ..... | ..... | ..... | ..... | 280 | 831 | | 34 |
| 24,560 | 12,400 | ..... | ..... | ..... | ..... | 6,488 | 20,098 | | 35 |

TENNESSEE.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ..... | $1,370 | 13,732 | $16,630 | ..... | ..... | 800 | $600 | | |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | *Capital in real estate,* when not returned, has been estimated as equal to the royalty on six full years' production at the rate of the monthly production during the census year. | 1 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | 2 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | *Wages* represent net wages. | 3 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | *Materials* include, powder, fuze, lumber, etc., and feed for horses, mules, and oxen. The latter has been estimated at $6 per month per head and added to returns for materials. To total materials should perhaps be added for half-feed of animals (horses and mules) during idle time of mines temporarily suspending operations during the census year, $1,873. | 4 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | 5 |
| ..... | 120 | ..... | ..... | ..... | ..... | ..... | ..... | | 6 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | *Oxen:* Beside horses and mules 10 oxen were returned, valued at $355. | 7 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | *Furnaces:* The following returns from mines operated by and in connection with furnaces are probably duplicated by Mr. Swank's report. Number of mines, 11. Product, 24,844 tons; value, $49,315. Employés, 235; wages, $37,981. Real estate, $285,300; plant, $12,025; working capital, $8,400; total capital, $306,625. | 8 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | 9 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | | 10 |
| ..... | 1,250 | 13,732 | 16,630 | ..... | ..... | 800 | 600 | ..... | 11 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 12 |

TEXAS.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| ..... | ..... | 3,000 | $8,100 | $50 | $7,200 | ..... | ..... | | |
| ..... | ..... | 3,000 | 8,100 | 50 | 7,200 | ..... | ..... | ..... | 1 |

TABLE 14.—*Production of iron ore, by states and counties*—Continued.

VERMONT.

| | Counties. | Number of establishments. | Maximum yearly capacity of production. | Product of establishments, census year. | Value of product of establishments. | Total product census year, i. e., product of establishments and irregular product together. | Value of total product. | EMPLOYÉS. | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Men employed below ground. | Boys employed below ground. | Men employed above ground. | Boys employed above ground. | Total number of employés. |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | | | *Tons.* | *Tons.* | | *Tons.* | | | | | | |
| | The State | 1 | 1,120 | 560 | $2,750 | 560 | $2,750 | 7 | ..... | 8 | ..... | 15 |
| 1 | Franklin | 1 | 1,120 | 560 | 2,750 | 560 | 2,750 | 7 | ..... | 8 | ..... | 15 |

VIRGINIA.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 26 | 1,404,524 | 169,683 | $384,331 | 182,326 | $439,886 | 338 | 10 | 555 | 36 | 939 |
| 1 | Albemarle | ..... | ..... | ..... | ..... | 53 | 200 | ..... | ..... | ..... | ..... | ..... |
| 2 | Alleghany | 8 | 174,720 | 61,106 | 125,243 | 61,106 | 125,243 | 103 | 1 | 190 | 18 | 312 |
| 3 | Amherst | 3 | 224,000 | 10,640 | 42,750 | 10,640 | 42,750 | 76 | 1 | 69 | 2 | 148 |
| 4 | Augusta | 2 | 85,120 | 16,052 | 33,315 | 16,762 | 33,823 | 49 | 3 | 132 | 5 | 189 |
| 5 | Bedford | ..... | ..... | ..... | ..... | 500 | 750 | ..... | ..... | ..... | ..... | ..... |
| 6 | Botetourt | 2 | 268,800 | 28,225 | 63,003 | 28,225 | 63,003 | 30 | 2 | 50 | 3 | 85 |
| 7 | Campbell | 1 | 84 | 84 | 150 | 308 | 934 | 5 | ..... | ..... | 4 | 9 |
| 8 | Louisa | ..... | ..... | ..... | ..... | 14 | 173 | ..... | ..... | ..... | ..... | ..... |
| 9 | Nelson | 1 | 56,000 | 3,360 | 15,000 | 3,360 | 15,000 | 30 | ..... | 30 | ..... | 60 |
| 10 | Pittsylvania | ..... | ..... | ..... | ..... | 11,202 | 50,814 | ..... | ..... | ..... | ..... | ..... |
| 11 | Rockingham | 2 | 187,000 | 31,360 | 64,000 | 31,360 | 64,000 | 5 | ..... | 48 | 2 | 55 |
| 12 | Shenandoah | 2 | 156,800 | 7,840 | 14,220 | 7,856 | 14,283 | 26 | 3 | 6 | 2 | 37 |
| 13 | Wythe | 5 | 252,000 | 10,416 | 26,650 | 10,416 | 26,650 | 14 | ..... | 30 | ..... | 44 |
| 14 | Name of county not given | ..... | ..... | ..... | ..... | 434 | 2,263 | ..... | ..... | ..... | ..... | ..... |

WEST VIRGINIA.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 8 | 140,520 | 60,371 | $88,595 | 61,216 | $91,057 | 150 | ..... | 114 | 2 | 266 |
| 1 | Braxton | 1 | 5,000 | 2,500 | 3,333 | 2,500 | 3,333 | 9 | ..... | 1 | ..... | 10 |
| 2 | Hampshire | 1 | 8,500 | 7,000 | 10,500 | 7,000 | 10,500 | ..... | ..... | 25 | ..... | 25 |
| 3 | Hardy | 1 | 6,720 | 448 | 400 | 448 | 400 | 6 | ..... | ..... | ..... | 6 |
| 4 | Kanawha | ..... | ..... | ..... | ..... | 845 | 2,462 | ..... | ..... | ..... | ..... | ..... |
| 5 | Morgan | 1 | 16,800 | 2,800 | 5,000 | 2,800 | 5,000 | ..... | ..... | 29 | 1 | 30 |
| 6 | Preston | 3 | 75,500 | 33,825 | 44,722 | 33,825 | 44,722 | 85 | ..... | 44 | 1 | 130 |
| 7 | Taylor | 1 | 28,000 | 13,798 | 24,640 | 13,798 | 24,640 | 50 | ..... | 15 | ..... | 65 |

WISCONSIN.

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 2 | 45,600 | 41,440 | $73,000 | 41,440 | $73,000 | 20 | 2 | 37 | 3 | 62 |
| 1 | Dodge | 1 | 40,000 | 39,200 | 70,000 | 39,200 | 70,000 | 20 | 2 | 29 | 3 | 54 |
| 2 | Sauk | 1 | 5,600 | 2,240 | 3,000 | 2,240 | 3,000 | ..... | ..... | 8 | ..... | 8 |

TABLE 14.—*Production of iron ore, by states and counties*—Continued.

VERMONT.

| EMPLOYÉS. | | | | CAPITAL. | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of miners. | Number of laborers. | Number of administrative force. | Total wages paid. | Value of real estate. | Value of plant. | Amount used as working capital. | Total capital employed and invested. | Number of mining company's stores. | Value of all materials used. | Number of horses. | Value of horses. | Number of mules. | Value of mules. | |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | |
| 15 | ..... | ..... | $1,500 | $1,000 | $500 | $500 | $2,000 | ..... | $536 | 1 | $100 | ..... | ..... | |
| 15 | ..... | ..... | 1,500 | 1,000 | 500 | 500 | 2,000 | ..... | 536 | 1 | 100 | ..... | ..... | 1 |

VIRGINIA.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 412 | 488 | 89 | $186,279 | $1,490,500 | $206,000 | $106,625 | $1,809,125 | 24 | $37,783 | 100 | $10,175 | 148 | $16,675 | |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1 |
| 122 | 150 | 40 | 86,950 | 302,000 | 62,400 | 36,600 | 401,000 | 8 | 15,055 | 13 | 1,400 | 55 | 6,350 | 2 |
| 75 | 61 | 12 | 16,100 | 152,000 | 50,000 | 6,500 | 208,500 | 2 | 3,602 | 41 | 4,075 | 25 | 2,475 | 3 |
| 107 | 70 | 12 | 39,851 | 200,000 | 20,000 | 22,000 | 248,000 | 2 | 6,804 | 6 | 800 | 16 | 2,300 | 4 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 5 |
| 4 | 74 | 7 | 8,400 | 200,000 | 10,000 | 9,700 | 219,700 | 2 | 1,225 | 1 | 75 | 1 | 100 | 6 |
| 5 | 3 | 1 | 300 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 7 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 8 |
| 30 | 20 | 10 | 3,600 | 50,000 | 30,000 | 2,500 | 82,500 | 1 | 2,212 | ..... | ..... | 12 | 1,200 | 9 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 |
| 15 | 38 | 2 | 14,000 | 415,000 | 8,100 | 10,000 | 433,100 | 2 | 2,100 | 3 | 150 | 26 | 2,950 | 11 |
| 26 | 9 | 2 | 8,838 | 90,000 | 12,000 | 12,000 | 114,000 | 2 | 2,375 | 10 | 850 | 8 | 800 | 12 |
| 28 | 16 | 3 | 8,240 | 87,500 | 7,500 | 7,325 | 102,325 | 5 | 3,750 | 32 | 2,825 | 5 | 500 | 13 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 14 |

WEST VIRGINIA.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 105 | 93 | 8 | $63,985 | $88,500 | $16,550 | $10,450 | $115,500 | 3 | $5,001 | 22 | $1,200 | 9 | $800 | |
| 9 | ..... | 1 | 1,050 | 4,500 | 500 | 350 | 5,350 | ..... | 200 | ..... | ..... | ..... | ..... | 1 |
| 9 | 15 | 1 | 6,500 | 10,000 | 6,000 | 1,000 | 17,000 | ..... | 500 | ..... | ..... | ..... | ..... | 2 |
| 6 | ..... | ..... | 300 | 25,000 | 50 | 100 | 25,150 | 1 | ..... | ..... | ..... | ..... | ..... | 3 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 4 |
| 15 | 14 | 1 | 2,250 | 5,000 | 1,500 | 1,500 | 8,000 | ..... | 234 | 18 | 900 | ..... | ..... | 5 |
| 81 | 47 | 2 | 33,571 | 38,000 | 6,500 | 5,000 | 49,500 | 2 | 3,356 | 4 | 300 | 7 | 700 | 6 |
| 45 | 17 | 3 | 19,414 | 6,000 | 2,000 | 2,500 | 10,500 | ..... | 771 | ..... | ..... | 2 | 100 | 7 |

WISCONSIN.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 33 | 28 | 1 | $17,000 | $160,000 | $10,000 | $16,000 | $186,000 | 1 | $2,250 | 10 | $950 | 4 | $200 | |
| 25 | 28 | 1 | 15,000 | 60,000 | 5,000 | 6,000 | 71,000 | ..... | 2,000 | 3 | 350 | 4 | 200 | 1 |
| 8 | ..... | ..... | 2,000 | 100,000 | 5,000 | 10,000 | 115,000 | 1 | 250 | 7 | 600 | ..... | ..... | 2 |

TABLE 14.—*Production of iron ore, by states and counties*—Continued.

VERMONT.

| | Counties. | STEAM-POWER. Number of steam-engines. | Value of steam-engines. | Horse-power of steam-engines. | Number of boilers. | Value of boilers. | Horse-power of boilers. | Amount of wood used for fuel. | Value of cord-wood. | Amount of unsawed lumber (other than for fuel). | Value of unsawed lumber. | Amount of sawed lumber. | Value of sawed lumber. | Cost of explosives. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 |
| | | | | | | | | *Cords.* | | *Lin. feet.* | | *Ft. B. M.* | | |
| | The State | | | | | | | | | | | | | $138 |
| 1 | Franklin | | | | | | | | | | | | | 138 |

VIRGINIA.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 8 | $13,025 | 154 | 11 | $8,600 | 199 | 6,400 | $2,384 | 611,660 | $6,110 | | | $13,105 |
| 1 | Albemarle | | | | | | | | | | | | | |
| 2 | Alleghany | 3 | 8,000 | 50 | 4 | 2,400 | 50 | | | 571,660 | 5,710 | | | 0,068 |
| 3 | Amherst | | | | | | | | | | | | | 1,018 |
| 4 | Augusta | 1 | 325 | 20 | 1 | 500 | 20 | | | | | | | 1,842 |
| 5 | Bedford | | | | | | | | | | | | | |
| 6 | Botetourt | | | | | | | | | | | | | 738 |
| 7 | Campbell | | | | | | | | | | | | | |
| 8 | Louisa | | | | | | | | | | | | | |
| 9 | Nelson | 1 | 2,500 | 15 | 3 | 3,000 | 50 | 900 | 1,260 | | | | | 308 |
| 10 | Pittsylvania | | | | | | | | | | | | | |
| 11 | Rockingham | 2 | 1,200 | 30 | 2 | 1,700 | 39 | 300 | 450 | 5,000 | 50 | | | 304 |
| 12 | Shenandoah | | | | | | | 5,000 | 300 | 18,000 | 180 | | | 473 |
| 13 | Wythe | 1 | 1,000 | 30 | 1 | 1,000 | 40 | 200 | 374 | 17,000 | 220 | | | 524 |
| 14 | Name of county not given | | | | | | | | | | | | | |

WEST VIRGINIA.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | | | | | | | | | | | | | $1,220 |
| 1 | Braxton | | | | | | | | | | | | | |
| 2 | Hampshire | | | | | | | | | | | | | |
| 3 | Hardy | | | | | | | | | | | | | |
| 4 | Kanawha | | | | | | | | | | | | | |
| 5 | Morgan | | | | | | | | | | | | | 84 |
| 6 | Preston | | | | | | | | | | | | | 917 |
| 7 | Taylor | | | | | | | | | | | | | 225 |

WISCONSIN.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | The State | 1 | $2,000 | 25 | 2 | $1,000 | 50 | | | | | | | $225 |
| 1 | Dodge | 1 | 2,000 | 25 | 2 | 1,000 | 50 | | | | | | | 75 |
| 2 | Sauk | | | | | | | | | | | | | 150 |

TABLE 14.—*Production of iron ore, by states and counties*—Continued.

VERMONT.

| Value of all machinery. | Value of buildings. | IRREGULAR PRODUCTION. Mined by furnaces. Product, census year. | Value of product. | Value of tools and machinery. | Estimated value of labor in producing and bringing to furnace. | Bought by furnaces. From small mines within the county, census year. | Amount paid for this ore. | Remarks. | |
|---|---|---|---|---|---|---|---|---|---|
| 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | | |
| | | *Tons.* | | | | *Tons.* | | | |
| $225 | | | | | | | | | |
| 225 | | | | | | | | | 1 |

VIRGINIA.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $37,785 | | 500 | $750 | | | 12,143 | $54,805 | | |
| | | | | | | 53 | 200 | *Wages* represent the net earnings of the employés, the operators furnishing all the powder, oil, tools, etc. | 1 |
| 21,000 | | | | | | | | | 2 |
| 25 | | | | | | | | *Materials:* To original returns has been added $6 per working month, per mule or horse, for feed. To total materials for the state may be added for half-feed of animals during idle time of mines temporarily suspending operations during the census year, $4,044. | 3 |
| 1,010 | | | | | | 110 | 508 | | 4 |
| | | 500 | 750 | | | | | | 5 |
| | | | | | | | | *Capital in real estate*, when not returned, has been estimated equal to the royalty on six full years' production at the rate of the monthly production during the census year. | 6 |
| | | | | | | 224 | 784 | *Furnaces:* The returns from mine schedules include the following, which are probably duplicated in Mr. Swank's returns: Number of mines, 4. Product, census year, 28,066 tons; value, $50,898. Employés, 95; wages, $21,217. Real estate, $104,500; plant, $7,000; working capital, $8,925; total capital, $120,425. | 7 |
| | | | | | | 14 | 173 | | 8 |
| 10,000 | | | | | | | | | 9 |
| | | | | | | 11,292 | 50,814 | | 10 |
| 3,000 | | | | | | | | | 11 |
| 650 | | | | | | 16 | 63 | | 12 |
| 1,500 | | | | | | | | | 13 |
| | | | | | | 434 | 2,203 | | 14 |

WEST VIRGINIA.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $1,500 | $2,000 | | | | | 845 | $2,402 | *Wages* represent the net earnings of the employés, the operators furnishing the powder, oil, tools, etc. | |
| | | | | | | | | *Materials:* To original returns has been added $6 per working-month, per mule or horse, for feed. To total materials for the state may be added $5 50 *for half-feed of horses and mules during idle time of mines temporarily* suspending operations during census year. | 1 |
| 1,500 | | | | | | | | | 2 |
| | | | | | | | | *Capital in real estate*, when not returned, has been estimated as equal to the royalty on six full years' production at the rate of the monthly production during census year. | 3 |
| | | | | | | 845 | 2,402 | | 4 |
| | | | | | | | | *Furnaces:* The returns from mine schedules include the following, which are probably duplicated in Mr. Swank's returns:—Number of mines, 5. Products, census year, 57,898 tons; value, $82,873. Employés, 207; wages, $60,364. Real estate, $43,500; plant, $14,000; working capital, $8,300; total capital, $65,850. | 5 |
| | 2,000 | | | | | | | | 6 |
| | | | | | | | | | 7 |

WISCONSIN.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $3,000 | | | | | | | | | |
| 3,000 | | | | | | | | | 1 |
| | | | | | | | | | 2 |

TABLE 15.—*Statistics of the production of iron ore, by states.*

[NOTE.—With the exception of columns 5 and 6, in which the regular and irregular product are

| | States. | Number of counties reporting. | Number of establishments. | Maximum yearly capacity of production. | Product of establishments, census year. | Value of product of establishments. | Total product, census year, *i. e.*, product of establishments and irregular product together. | Value of total product. | EMPLOYÉS. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Men employed below ground. | Boys employed below ground. | Men employed above ground. |
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| | | | | *Tons.* | *Tons.* | | *Tons.* | | | | |
| | Total | 160 | 805 | 13,462,917 | 7,004,829 | $20,470,756 | 7,974,806 | $23,150,957 | 13,735 | 249 | 16,345 |
| 1 | Alabama | 10 | 17 | 310,109 | 184,110 | 189,108 | 191,076 | 201,865 | 109 | 6 | 590 |
| 2 | Connecticut | 1 | 4 | 45,800 | 35,018 | 147,799 | 35,018 | 147,799 | 20 | ..... | 170 |
| 3 | Delaware | 1 | 2 | 18,389 | 2,726 | 6,553 | 2,726 | 6,553 | ..... | ..... | 30 |
| 4 | Georgia | 3 | 7 | 101,157 | 72,705 | 120,692 | 91,416 | 143,622 | 50 | ..... | 287 |
| 5 | Kentucky | 9 | 5 | 105,420 | 33,522 | 88,930 | 64,809 | 165,905 | 45 | ..... | 255 |
| 6 | Indiana | 1 | ..... | ..... | ..... | ..... | 518 | 1,018 | ..... | ..... | ..... |
| 7 | Maine | 1 | 1 | 12,000 | 6,000 | 9,000 | 6,000 | 9,000 | ..... | ..... | 20 |
| 8 | Maryland | 11 | 13 | 145,296 | 57,940 | 118,050 | 139,628 | 421,091 | 12 | ..... | 295 |
| 9 | Massachusetts | 1 | 9 | 87,360 | 62,637 | 226,130 | 62,637 | 226,130 | 224 | ..... | 134 |
| 10 | Michigan | 2 | 43 | 2,223,365 | 1,837,712 | 6,034,648 | 1,837,712 | 6,034,648 | 3,120 | 17 | 2,229 |
| 11 | Missouri | 3 | 48 | 908,001 | 386,197 | 1,074,875 | 386,197 | 1,074,875 | 358 | 10 | 1,435 |
| 12 | New Jersey | 6 | 109 | 1,487,829 | 754,872 | 2,900,442 | 757,372 | 2,910,442 | 3,264 | 60 | 1,385 |
| 13 | New York | 13 | 78 | 2,140,129 | 1,230,759 | 3,499,182 | 1,262,127 | 3,654,872 | 2,417 | 35 | 2,083 |
| 14 | North Carolina | 6 | 9 | 11,980 | 3,276 | 5,102 | 3,318 | 5,285 | 19 | ..... | 28 |
| 15 | Oregon | 1 | 1 | 22,400 | 6,972 | 4,669 | 6,972 | 4,669 | 11 | ..... | 3 |
| 16 | Ohio | 15 | 30 | 556,158 | 198,835 | 448,000 | 547,403 | 1,269,530 | 602 | 38 | 1,033 |
| 17 | Pennsylvania | 35 | 358 | 3,408,506 | 1,820,561 | 4,318,999 | 2,185,675 | 5,517,079 | 2,892 | 62 | 5,196 |
| 18 | Tennessee | 12 | 34 | 218,254 | 89,933 | 129,951 | 104,465 | 147,181 | 77 | ..... | 443 |
| 19 | Texas | 1 | ..... | ..... | ..... | ..... | 3,600 | 8,100 | ..... | ..... | ..... |
| 20 | Vermont | 1 | 1 | 1,120 | 560 | 2,750 | 560 | 2,750 | 7 | ..... | 8 |
| 21 | Virginia | 13 | 26 | 1,404,524 | 169,683 | 384,331 | 182,326 | 439,886 | 338 | 10 | 555 |
| 22 | West Virginia | 7 | 8 | 140,520 | 60,371 | 88,595 | 61,216 | 91,057 | 150 | ..... | 114 |
| 23 | Wisconsin | 2 | 2 | 45,600 | 41,440 | 73,000 | 41,440 | 73,000 | 20 | 2 | 37 |

TABLE 15.—*Statistics of the production of iron ore, by states.*

combined, all the questions in columns 1 to 40, both inclusive, relate to regular establishments only.]

| EMPLOYÉS. | | | | | | CAPITAL. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Boys employed above ground. | Total number of employés. | Number of miners. | Number of laborers. | Number of administrative force. | Total wages paid. | Value of real estate. | Value of plant. | Amount used as working capital. | Total capital employed and invested. | Number of mining company's stores. | Value of all materials used. | Number of horses. | |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | |
| 1,339 | 31,068 | 17,023 | 12,492 | 1,253 | $9,538,117 | $48,274,149 | $8,057,375 | $4,850,763 | $61,782,287 | 175 | $2,894,011 | 2,744 | |
| 33 | 798 | 503 | 216 | 19 | 123,342 | 438,772 | 46,770 | 50,000 | 536,442 | 0 | 17,625 | a79 | 1 |
| 1 | 200 | 100 | 90 | 10 | 61,167 | 368,000 | 39,800 | 18,500 | 426,300 | ..... | 20,853 | 98 | 2 |
| 11 | 47 | 20 | 25 | 2 | 2,865 | 40,000 | 6,300 | 2,000 | 48,300 | ..... | 941 | 6 | 3 |
| 5 | 342 | 217 | 105 | 20 | 108,796 | 101,200 | 33,925 | 35,700 | 170,825 | 4 | 8,345 | ..... | 4 |
| 25 | 325 | 224 | 88 | 13 | 69,319 | 678,329 | 59,500 | 42,000 | 779,829 | 2 | 8,100 | 91 | 5 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 6 |
| ..... | 20 | 12 | 8 | ..... | 9,000 | 2,500 | 2,000 | 2,000 | 6,500 | ..... | 3,150 | 16 | 7 |
| 22 | 329 | 110 | 192 | 18 | 61,138 | 310,600 | 135,464 | 44,450 | 490,514 | 2 | 23,726 | 37 | 8 |
| 24 | 382 | 216 | 156 | 10 | 117,158 | 183,000 | 70,000 | 22,400 | 276,000 | ..... | 43,136 | 50 | 9 |
| 196 | 5,562 | 3,103 | 2,180 | 210 | 2,573,857 | 12,452,311 | 2,789,944 | 2,254,520 | 17,496,775 | 14 | 930,711 | 390 | 10 |
| 90 | 1,893 | 1,126 | 690 | 77 | 417,871 | 4,066,223 | 678,313 | 254,020 | 5,598,556 | 7 | 104,955 | 67 | 11 |
| 93 | 4,811 | 2,931 | 1,754 | 126 | 1,606,257 | 4,797,620 | 841,226 | 562,915 | 6,201,761 | 23 | 584,229 | 70 | 12 |
| 140 | 4,675 | 2,209 | 2,216 | 190 | 1,507,395 | 6,443,449 | 1,281,740 | 537,950 | 8,263,139 | 24 | 534,395 | 323 | 13 |
| ..... | 47 | 38 | 4 | 5 | 4,059 | 8,650 | 2,750 | 1,900 | 13,300 | 1 | 905 | ..... | 14 |
| ..... | 14 | 11 | 2 | 1 | 2,210 | 9,750 | 5,000 | 2,225 | 16,975 | ..... | 600 | ..... | 15 |
| 43 | 1,716 | 1,213 | 459 | 44 | 320,723 | 857,401 | 263,145 | 128,170 | 1,248,725 | 8 | 23,806 | 35 | 16 |
| 583 | 8,733 | 4,717 | 3,630 | 386 | 2,192,167 | 14,759,894 | 2,131,743 | 730,004 | 17,621,701 | 30 | 525,165 | 1,327 | 17 |
| 32 | 552 | 419 | 109 | 24 | 83,520 | 410,450 | 36,005 | 27,375 | 473,920 | 14 | 8,679 | 22 | 18 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 19 |
| ..... | 15 | 15 | ..... | ..... | 1,500 | 1,000 | 500 | 500 | 2,000 | ..... | 536 | 1 | 20 |
| 36 | 939 | 412 | 438 | 89 | 186,279 | 1,496,500 | 206,000 | 106,625 | 1,809,125 | 24 | 37,783 | 100 | 21 |
| 2 | 266 | 165 | 93 | 8 | 63,985 | 88,500 | 16,550 | 10,450 | 115,500 | 3 | 5,061 | 22 | 22 |
| 3 | 62 | 33 | 28 | 1 | 17,000 | 160,000 | 10,000 | 16,000 | 186,000 | 1 | 2,250 | 10 | 23 |

*a* Includes 64 oxen.

TABLE 15.—*Statistics of the production of iron ore, by states*—Continued.

| | States. | Value of horses. | Number of mules. | Value of mules. | STEAM-POWER. Number of steam-engines. | Value of steam-engines. | Horse-power of steam-engines. | Number of boilers. | Value of boilers. | Horse-power of boilers. | Amount of wood used for fuel. | Value of cord-wood. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 |
| | | | | | | | | | | | *Cords.* | |
| | Total | $287,567 | 1,249 | $142,935 | 821 | $1,061,882 | 24,838 | 1,093 | $643,846 | 28,422 | 88,743 | $178,059 |
| 1 | Alabama | 2,835 | 107 | 11,070 | 6 | 4,550 | 192 | 6 | 2,250 | 192 | 1,536 | 2,080 |
| 2 | Connecticut | *11,950* | ..... | ..... | *5* | *2,600* | *105* | *6* | *5,200* | *135* | *5* | 25 |
| 3 | Delaware | 400 | 16 | 1,140 | 4 | 2,500 | 40 | 3 | 1,300 | 28 | 23 | *53* |
| 4 | Georgia | ..... | 68 | 8,650 | ..... | ..... | ..... | 1 | 300 | 20 | ..... | ..... |
| 5 | Kentucky | 8,300 | 26 | 1,500 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 6 | Indiana | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 7 | Maine | 1,600 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 8 | Maryland | 5,600 | 45 | 6,100 | 11 | 9,600 | 263 | 11 | 7,200 | 263 | 910 | 2,000 |
| 9 | Massachusetts | 6,575 | 2 | 200 | 8 | 9,600 | 220 | 19 | 13,450 | 455 | ..... | ..... |
| 10 | Michigan | 64,350 | 37 | 4,670 | 134 | 210,850 | 6,574 | 125 | 108,852 | 6,200 | 52,045 | 116,909 |
| 11 | Missouri | 5,015 | 241 | 31,370 | 17 | 31,800 | 448 | 24 | 20,150 | 594 | 6,447 | 15,157 |
| 12 | New Jersey | 6,065 | 48 | 5,500 | 152 | 105,945 | 4,486 | 192 | 110,005 | 4,921 | 2 | 8 |
| 13 | New York | 30,035 | 48 | 6,880 | 87 | 121,591 | 3,039 | 118 | 115,034 | 4,267 | 20,698 | 37,121 |
| 14 | North Carolina | ..... | 2 | 200 | 2 | 800 | 20 | 2 | 550 | 20 | 30 | 75 |
| 15 | Oregon | ..... | ..... | ..... | *1* | *500* | *16* | *1* | *500* | *16* | *52* | 104 |
| 16 | Ohio | 3,500 | 55 | 5,125 | 5 | 4,925 | 130 | 13 | 3,375 | 180 | ..... | ..... |
| 17 | Pennsylvania | 117,717 | 309 | 32,755 | 380 | 451,390 | 9,117 | 559 | 246,080 | 10,864 | 595 | 1,483 |
| 18 | Tennessee | 1,600 | 84 | 10,100 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 19 | Texas | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 20 | Vermont | 100 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 21 | Virginia | 10,175 | 148 | 16,675 | 8 | 13,025 | 154 | 11 | 8,600 | 199 | 6,400 | 2,384 |
| 22 | West Virginia | 1,200 | 9 | 800 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 23 | Wisconsin | 950 | 4 | 200 | 1 | 2,000 | 25 | 2 | 1,000 | 50 | ..... | ..... |

TABLE 15.—*Statistics of the production of iron ore, by states*—Continued.

| Amount of unsawed lumber (other than for fuel). | Value of unsawed lumber. | Amount of sawed lumber. | Value of sawed lumber. | Cost of explosives. | Value of all machinery. | Value of buildings. | IRREGULAR PRODUCTION. Mined by furnaces. Product, census year. | Value of product. | Value of tools and machinery. | Estimated value of labor in producing and bringing to furnace. | Bought by furnaces. From small mines within the county, census year. | Amount paid for this ore. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | |
| *Lin. feet.* | | *Ft. B. M.* | | | | | *Tons.* | | | | *Tons.* | | |
| 6,912,031 | $115,305 | 6,878,000 | $95,244 | $184,452 | $3,211,548 | $426,703 | 412,419 | $1,010,414 | $107,881 | $243,753 | 494,956 | $1,656,787 | |
| 34,000 | 310 | ..... | ..... | 4,240 | 17,765 | 6,050 | ..... | ..... | ..... | ..... | 7,566 | 12,757 | 1 |
| 2,100 | 105 | 20,000 | 325 | 3,669 | 22,225 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2 |
| ..... | ..... | ..... | ..... | 3 | 4,400 | 150 | ..... | ..... | ..... | ..... | ..... | ..... | 3 |
| ..... | ..... | ..... | ..... | 4,200 | 1,250 | 16,800 | ..... | ..... | ..... | ..... | 18,711 | 22,930 | 4 |
| 10,000 | 500 | ..... | ..... | 1,470 | ..... | ..... | 4,940 | 10,155 | ..... | 6,000 | 26,347 | 66,820 | 5 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 512 | 1,018 | 6 |
| ..... | ..... | ..... | ..... | 2,000 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 7 |
| ..... | ..... | ..... | ..... | 780 | 17,164 | 9,900 | 3,581 | 12,244 | 3,600 | 4,094 | 78,107 | 201,397 | 8 |
| 33,628 | 2,354 | 25,000 | 350 | 6,818 | 34,900 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 9 |
| 3,571,000 | 25,381 | 6,833,000 | 94,569 | 160,561 | 838,558 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 10 |
| 155,000 | 2,300 | ..... | ..... | 28,072 | 131,808 | 8,085 | ..... | ..... | ..... | ..... | ..... | ..... | 11 |
| 1,067,751 | 43,076 | ..... | ..... | 105,130 | 519,954 | 15,566 | ..... | ..... | ..... | ..... | ..... | ..... | 12 |
| 49,450 | 1,320 | ..... | ..... | 77,003 | 694,906 | 30,425 | 200 | 450 | 2,500 | 2,200 | 22,108 | 155,200 | 13 |
| 250 | 5 | ..... | ..... | 72 | 1,850 | 50 | 41 | 183 | ..... | 182 | ..... | ..... | 14 |
| ..... | 304 | ..... | ..... | 236 | 1,000 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 15 |
| 155,000 | 1,900 | ..... | ..... | 7,948 | 8,600 | 20,125 | 284,868 | 651,940 | ..... | ..... | 63,600 | 160,581 | 16 |
| 1,208,092 | 20,840 | ..... | ..... | 65,288 | 934,658 | 307,182 | 100,957 | 318,953 | 101,731 | 224,077 | 264,157 | 879,127 | 17 |
| 18,000 | 900 | ..... | ..... | 1,200 | ..... | 1,370 | 13,732 | 16,630 | ..... | ..... | 800 | 600 | 18 |
| ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3,000 | 8,100 | 50 | 7,200 | ..... | ..... | 19 |
| ..... | ..... | ..... | ..... | 138 | 225 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 20 |
| 611,600 | 6,110 | ..... | ..... | 13,165 | 37,785 | ..... | 500 | 750 | ..... | ..... | 12,143 | 54,805 | 21 |
| ..... | ..... | ..... | ..... | 1,226 | 1,500 | 2,000 | ..... | ..... | ..... | ..... | 845 | 2,462 | 22 |
| ..... | ..... | ..... | ..... | 225 | 3,000 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 23 |

# GENERAL ANALYSIS OF

By C. F.

TABLE 16.—*Production of iron*

| | Name of State. | Number of counties reporting. | Number of establishments. | Maximum yearly capacity of production of working establishments. | Product of establishments, census year. | Value of product of establishments. | Irregular product, census year. | Total product, census year. | Value of total product. | Value of all materials used in regular industry. | Wages paid in establisments of regular industry. | Men employed above ground. | Men employed below ground. | Boys under 16 employed above ground. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| | | | | *Tons.* | *Tons.* | | *Tons.* | *Tons.* | | | | | | |
| | The United States | 135 | 805 | 13,462,917 | 7,004,829 | $20,470,756 | 969,977 | 7,974,806 | $23,156,957 | $2,894,011 | $9,538,117 | 16,345 | 13,735 | 1,369 |
| 1 | Alabama | 10 | 17 | 310,109 | 184,110 | 189,108 | 7,566 | 191,676 | 201,865 | 17,625 | 123,342 | 500 | 109 | 33 |
| 2 | Connecticut | 1 | 4 | 45,800 | 35,018 | 147,799 | ..... | 35,018 | 147,799 | 20,853 | 61,167 | 179 | 20 | 1 |
| 3 | Delaware | 1 | 2 | 18,389 | 2,726 | 6,553 | ..... | 2,726 | 6,553 | 941 | 2,865 | 36 | ..... | 11 |
| 4 | Georgia | 3 | 7 | 101,157 | 72,705 | 120,692 | 18,711 | 91,416 | 143,622 | 8,345 | 108,796 | 287 | 50 | 5 |
| 5 | Kentucky | 4 | 5 | 105,420 | 33,522 | 88,930 | 31,287 | 64,809 | 165,905 | 8,100 | 69,319 | 255 | 45 | 25 |
| 6 | Indiana | 1 | ... | ..... | ..... | ..... | 513 | 513 | 1,018 | ..... | ..... | ..... | ..... | ..... |
| 7 | Maine | 1 | 1 | 12,000 | 6,000 | 9,000 | ..... | 6,000 | 9,000 | 3,150 | 9,000 | 20 | ..... | ..... |
| 8 | Maryland | 5 | 13 | 145,296 | 57,940 | 118,050 | 81,688 | 139,628 | 421,601 | 23,726 | 61,138 | 295 | 12 | 22 |
| 9 | Massachusetts | 1 | 9 | 87,360 | 62,637 | 226,130 | ..... | 62,637 | 226,130 | 43,136 | 117,158 | 134 | 224 | 24 |
| 10 | Michigan | 2 | 43 | 2,223,365 | 1,837,712 | 6,034,048 | ..... | 1,837,712 | 6,034,648 | 939,711 | 2,573,857 | 2,229 | 3,120 | 196 |
| 11 | Missouri | 8 | 48 | 968,001 | 386,197 | 1,074,875 | ..... | 386,197 | 1,674,875 | 104,955 | 417,371 | 1,435 | 358 | 90 |
| 12 | New Jersey | 6 | 109 | 1,487,829 | 754,872 | 2,900,442 | 2,500 | 757,372 | 2,910,442 | 584,229 | 1,606,257 | 1,385 | 3,264 | 93 |
| 13 | New York | 12 | 78 | 2,149,129 | 1,239,759 | 3,499,132 | 22,368 | 1,262,127 | 3,654,872 | 534,395 | 1,507,395 | 2,083 | 2,417 | 140 |
| 14 | North Carolina | 6 | 9 | 11,980 | 3,276 | 5,102 | 42 | 3,318 | 5,285 | 965 | 4,059 | 28 | 19 | ..... |
| 15 | Oregon | 1 | 1 | 22,400 | 6,972 | 4,660 | ..... | 6,972 | 4,660 | 600 | 2,210 | 3 | 11 | ..... |
| 16 | Ohio | 8 | 30 | 556,158 | 198,835 | 448,000 | 348,568 | 547,403 | 1,269,530 | 23,806 | 320,723 | 1,033 | 602 | 43 |
| 17 | Pennsylvania | 34 | 358 | 8,408,506 | 1,820,561 | 4,318,999 | 365,114 | 2,185,675 | 5,517,079 | 525,165 | 2,192,167 | 5,196 | 2,892 | 583 |
| 18 | Tennessee | 12 | 34 | 218,254 | 89,033 | 120,951 | 14,532 | 104,465 | 147,181 | 8,679 | 83,529 | 443 | 77 | 32 |
| 19 | Texas | 1 | ... | ..... | ..... | ..... | 3,600 | 3,600 | 8,100 | ..... | ..... | ..... | ..... | ..... |
| 20 | Vermont | 1 | 1 | 1,120 | 560 | 2,750 | ..... | 560 | 2,750 | 536 | 1,500 | 8 | 7 | ..... |
| 21 | Virginia | 9 | 20 | 1,404,524 | 169,068 | 384,331 | 12,643 | 182,326 | 439,886 | 37,783 | 186,279 | 555 | 338 | 36 |
| 22 | West Virginia | 6 | 8 | 140,520 | 60,371 | 88,595 | 845 | 61,216 | 91,057 | 5,001 | 63,985 | 114 | 150 | 2 |
| 23 | Wisconsin | 2 | 2 | 45,600 | 41,440 | 73,000 | ..... | 41,440 | 73,000 | 2,250 | 17,000 | 37 | 20 | 3 |

*a* Prepared for Census Bulletin No. 270. These figures have been cor

# THE IRON-ORE STATISTICS.(a)

JOHNSON, JR.

*ore, by states (condensed table).*

| Boys employed below ground. | Total number of employés in regular establishments. | Number of miners. | Number of laborers. | Number of administrative force. | Number of steam-engines. | Total horse-power. | Value of all machinery. | Cost of explosives used. | Number of horses used in regular industry. | Number of mules used in regular industry. | Amount used as working capital. | Value of plant. | Value of real estate. | Total capital employed and invested in the regular industry. | Number of tons on which royalty is paid. | Gross amount paid as royalty in census year. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | |
| 240 | 31,668 | 17,023 | 12,492 | 1,253 | 821 | 24,838 | $3,211,548 | $484,452 | 2,080 | 1,249 | $4,850,763 | $8,057,375 | $48,274,149 | $61,782,287 | 2,334,524 | $1,020,429 | |
| 6 | 738 | 503 | 216 | 19 | 6 | 102 | 17,765 | 4,240 | *b* 0 | 107 | 50,900 | 46,770 | 438,772 | 536,442 | 48,010 | 5,776 | 1 |
| ... | 200 | *100* | *90* | *10* | *5* | 105 | *22,225* | *3,000* | *98* | *0* | *18,500* | *30,800* | *368,000* | *420,300* | *23,077* | *42,145* | 2 |
| .... | 47 | 20 | 25 | 2 | 4 | 40 | 4,400 | 3 | 0 | 16 | 2,000 | 6,300 | 40,000 | 48,300 | ..... | ..... | 3 |
| ... | 342 | 217 | 105 | 20 | 0 | 0 | 1,250 | 4,200 | 0 | 68 | 35,790 | 33,035 | 101,200 | 170,025 | ..... | ..... | 4 |
| .... | 325 | 224 | 88 | 13 | 0 | 0 | 0 | 1,470 | 91 | 26 | 42,000 | 50,500 | 678,320 | 770,820 | 17,986 | 3,578 | 5 |
| .... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 6 |
| .... | 20 | 12 | 8 | ..... | ..... | ..... | ..... | 2,000 | 16 | 0 | 2,000 | 2,000 | 2,500 | 6,500 | ..... | ..... | 7 |
| .... | 329 | 119 | 192 | 18 | 11 | 263 | 17,164 | 789 | 37 | 45 | 44,450 | 135,404 | 310,600 | 490,514 | 11,536 | 5,387 | 8 |
| .... | 382 | 216 | 156 | 10 | 8 | 220 | 94,900 | 6,818 | 50 | 2 | 22,400 | 70,600 | 183,000 | 276,000 | 3,845 | 1,227 | 9 |
| 17 | 5,562 | 3,163 | 2,189 | 210 | 134 | 6,574 | 838,558 | 100,501 | 300 | 37 | 2,254,520 | 2,789,944 | 12,452,311 | 17,496,775 | 392,251 | 172,145 | 10 |
| 10 | 1,893 | 1,126 | 690 | 77 | 17 | 448 | 131,808 | 28,972 | 67 | 241 | 254,020 | 678,318 | 4,666,228 | 5,598,556 | 140,597 | 65,144 | 11 |
| 60 | 4,811 | 2,931 | 1,754 | 126 | 152 | 4,486 | 519,954 | 105,180 | 70 | 48 | 562,015 | 841,226 | 4,707,020 | 6,201,761 | 364,945 | 197,691 | 12 |
| 35 | 4,675 | 2,269 | 2,216 | 190 | 87 | 3,039 | 634,906 | 77,093 | 323 | 48 | 537,950 | 1,281,740 | 6,443,449 | 8,263,139 | 101,415 | 73,497 | 13 |
| .... | 47 | 38 | 4 | 5 | 2 | 29 | 1,850 | 72 | 0 | 2 | 1,900 | 2,750 | 8,050 | 13,300 | ..... | ..... | 14 |
| .... | *14* | *11* | 2 | *1* | *1* | *16* | *1,000* | *230* | *0* | *0* | 2,225 | *5,000* | *9,750* | *16,975* | ..... | ..... | 15 |
| 38 | 1,716 | 1,213 | 459 | 44 | 5 | 130 | 8,600 | 7,048 | 35 | 55 | 128,170 | 263,145 | 857,401 | 1,248,725 | 50,269 | 9,004 | 16 |
| 62 | 8,733 | 4,717 | 3,930 | 386 | 380 | 9,117 | 934,658 | 65,288 | 1,327 | 309 | 730,064 | 2,131,743 | 14,750,894 | 17,621,701 | 972,303 | 422,007 | 17 |
| .... | 552 | 410 | 109 | 24 | ..... | ..... | ..... | 1,209 | 22 | 84 | 27,375 | 36,095 | 410,450 | 473,920 | 48,063 | 10,569 | 18 |
| .... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 19 |
| .... | 15 | 15 | ..... | ..... | ..... | ..... | 225 | 138 | 1 | 0 | 500 | 500 | 1,000 | 2,000 | ..... | ..... | 20 |
| 10 | 930 | 412 | 438 | 80 | 8 | 154 | 37,785 | 13,105 | 106 | 148 | 106,625 | 206,000 | 1,496,500 | 1,809,125 | 51,044 | 11,323 | 21 |
| .... | 266 | 105 | 93 | 8 | 0 | 0 | 1,500 | 1,226 | 22 | 0 | 10,450 | 16,550 | 88,500 | 115,500 | 16,823 | 1,076 | 22 |
| 2 | 62 | 33 | 28 | 1 | 1 | 25 | 3,000 | 225 | 10 | 4 | 16,000 | 10,000 | 160,000 | 186,000 | ..... | ..... | 23 |

rected where necessary to make them accord with the final results.

*b* 64 oxen are also reported in Alabama.

TABLE 17.—*Production of iron ore,*

| | Name of state. | Product of largest mine. | Average product per mine. | Average number of hands to mine. | Average royalty paid per ton. | Average yearly income of man. | Average monthly net earnings of man. | Average number of tons raised per day per man. | Average per cent. of year employed in mining. | Per cent. of year not employed in mining. | Per cent. of year lost in strikes. | Average price per ton of ore at mine. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| | | *Tons.* | *Tons.* | | *Cents.* | | | | | | | |
| | The United States | 280,000 | 8,772 | 39 | 43.70 | $308 94 | $33 20 | 0.96 | 77.55 | 22.43 | 0.02 | $2 90 |
| 1 | Alabama | 23,364 | 10,330 | 43 | 11.83 | 171 07 | 24 70 | 1.43 | 57.91 | 42.09 | ..... | 1 05 |
| 2 | Connecticut | 14,405 | 8,754 | 50 | 178.00 | 306 60 | 27 99 | 0.64 | 91.28 | 8.72 | ..... | 4 22 |
| 3 | Delaware | 1,834 | 1,363 | 23 | ..... | 69 04 | 31 80 | 1.06 | 18.09 | 81.01 | ..... | 2 40 |
| 4 | Georgia | 44,225 | 10,366 | 49 | ..... | 320 46 | 33 81 | 0.90 | 78.99 | 21.01 | ..... | 1 57 |
| 5 | Kentucky | 17,435 | 6,704 | 65 | 19.89 | 221 82 | 27 18 | 0.50 | 68.02 | 30.78 | 1.20 | 2 56 |
| 6 | Maine | 6,000 | 6,000 | 20 | ..... | 450 00 | 112 51 | 3.00 | 33.33 | 66.67 | ..... | 1 50 |
| 7 | Maryland | 17,843 | 4,457 | 25 | 46.70 | 192 26 | 29 49 | 1.08 | 54.32 | 45.68 | ..... | 3 02 |
| 8 | Massachusetts | 19,079 | 6,960 | 42 | 33.00 | 316 64 | 32 04 | 0.66 | 82.35 | 17.65 | ..... | 3 61 |
| 9 | Michigan | 224,000 | 42,668 | 129 | 43.88 | 471 70 | 43 11 | 1.20 | 91.19 | 8.81 | ..... | 3 28 |
| 10 | Missouri | 128,708 | 8,046 | 39 | 46.33 | 226 46 | 25 03 | 0.90 | 75.41 | 24.59 | ..... | 4 33 |
| 11 | New Jersey | 85,622 | 6,925 | 44 | 54.17 | 339 59 | 30 84 | 0.74 | 71.03 | 28.18 | 0.79 | 3 84 |
| 12 | New York | 208,416 | 15,894 | 60 | 38.39 | 328 59 | 30 64 | 0.99 | 89.38 | 10.62 | ..... | 2 89 |
| 13 | North Carolina | 1,086 | 364 | 5 | ..... | 86 36 | 17 18 | 0.55 | 41.88 | 58.12 | ..... | 1 50 |
| 14 | Oregon | 6,972 | 6,972 | 14 | ..... | 157 86 | 25 06 | 3.16 | 52.50 | 47.50 | ..... | 0 67 |
| 15 | Ohio | 9,381 | 6,628 | 57 | 17.90 | 196 79 | 25 98 | 0.61 | 63.13 | 36.15 | 0.72 | 2 31 |
| 16 | Pennsylvania | 280,000 | 5,085 | 24 | 43.38 | 260 65 | 28 57 | 0.91 | 76.04 | 23.80 | 0.16 | 2 52 |
| 17 | Tennessee | 13,608 | 2,645 | 16 | 21.71 | 155 84 | 22 23 | 0.97 | 55.91 | 44.09 | ..... | 1 41 |
| 18 | Vermont | 500 | 500 | 15 | ..... | 100 00 | 25 00 | 0.37 | 33.33 | 66.67 | ..... | 4 91 |
| 19 | Virginia | 28,000 | 6,526 | 36 | 22.18 | 203 36 | 28 89 | 1.03 | 58.66 | 41.34 | ..... | 2 41 |
| 20 | West Virginia | 20,120 | 7,546 | 33 | 6.40 | 241 45 | 28 81 | 1.08 | 69.84 | 20.79 | 0.37 | 1 48 |
| 21 | Wisconsin | 39,200 | 20,720 | 31 | ..... | 285 71 | 35 71 | 3.34 | 66.67 | 33.33 | ..... | 1 76 |

*general average by states.*

| Cost of labor per ton of ore mined. | Cost of material per ton of ore mined. | Amount of interest, royalty, and profit per ton of ore. | Per cent. of value of product paid for labor. | Per cent. of value of product paid for material. | Per cent. of value of product left for royalty, profit, and interest. | Average horse-power of engines to mine. | Per cent. of miners to total force. | Per cent. of laborers in total force. | Per cent. of administrative force in total force. | Per cent. of capital in real estate. | Per cent. of capital in plant. | Per cent. of capital used for working capital. | Per cent. ratio of yearly product to total capital. | Per cent. ratio of tonnage produced to maximum capacity of production. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | |
| $1 35 | $0 41 | $1 14 | 46.59 | 14.15 | 39.26 | 31 | 56.00 | 39.45 | 3.96 | 78.14 | 14.01 | 7.85 | 33.13 | 52.45 | |
| 07 | 10 | 27 | 65.22 | 9.32 | 25.46 | 11 | 68.16 | 29.27 | 2.57 | 81.80 | 8.70 | 9.49 | 28.00 | 50.37 | 1 |
| 1 75 | 00 | 1 87 | 41.38 | 14.10 | 44.52 | 26 | 50.00 | 45.00 | 5.00 | 86.32 | 9.30 | 4.34 | 34.71 | 76.46 | 2 |
| 1 05 | 35 | 1 00 | 43.72 | 14.36 | 41.92 | 20 | 42.55 | 53.20 | 4.26 | 82.82 | 13.04 | 4.14 | 13.78 | 14.82 | 3 |
| 1 50 | 11 | 07 | 90.14 | 6.01 | 2.95 | ..... | 63.45 | 30.70 | 5.85 | 59.21 | 19.85 | 20.94 | 70.01 | 71.87 | 4 |
| 2 07 | 24 | 35 | 77.95 | 9.11 | 12.94 | ..... | 68.92 | 27.08 | 4.00 | 86.98 | 7.03 | 5.39 | 11.40 | 31.80 | 5 |
| 1 50 | 52 | *a* 52 | 100.00 | 35.00 | (*a*) | ..... | 60.00 | 40.00 | ..... | 38.46 | 30.77 | 30.77 | 72.20 | 50.00 | 6 |
| 1 06 | 41 | 57 | 51.79 | 20.10 | 28.11 | 20 | 36.17 | 58.36 | 5.47 | 63.32 | 27.62 | 9.06 | 24.07 | 39.88 | 7 |
| 1 87 | 08 | 1 00 | 51.81 | 10.07 | 20.12 | 24 | 56.54 | 40.84 | 2.62 | 66.30 | 25.58 | 8.12 | 81.93 | 71.70 | 8 |
| 1 40 | 51 | 1 38 | 42.05 | 15.00 | 41.75 | 153 | 56.87 | 39.56 | 3.77 | 71.10 | 15.94 | 12.89 | 34.40 | 82.52 | 9 |
| 1 08 | 27 | 2 98 | 24.92 | 6.27 | 68.81 | 9 | 59.48 | 36.45 | 4.07 | 83.34 | 12.11 | 4.54 | 30.00 | 39.00 | 10 |
| 2 13 | 77 | 04 | 55.38 | 20.14 | 24.48 | 41 | 60.02 | 36.46 | 2.02 | 77.36 | 13.56 | 9.08 | 40.77 | 50.74 | 11 |
| 1 22 | 43 | 1 17 | 43.08 | 15.27 | 41.65 | 39 | 48.53 | 47.40 | 4.06 | 77.98 | 15.51 | 6.51 | 42.34 | 57.60 | 12 |
| 1 24 | 20 | 03 | 70.56 | 18.01 | 1.53 | 3 | 80.85 | 8.51 | 10.64 | 65.04 | 20.07 | 14.28 | 38.36 | 27.35 | 13 |
| 32 | 09 | 26 | 47.33 | 12.85 | 39.82 | 16 | 78.57 | 14.28 | 7.14 | 57.44 | 29.46 | 13.11 | 27.61 | 31.13 | 14 |
| 1 60 | 12 | 47 | 73.60 | 5.31 | 21.09 | 4 | 70.69 | 26.75 | 2.56 | 68.66 | 21.07 | 10.26 | 35.88 | 35.75 | 15 |
| 1 20 | 20 | 88 | 50.76 | 12.16 | 37.08 | 25 | 54.01 | 41.57 | 4.42 | 83.76 | 12.16 | 4.14 | 24.51 | 53.41 | 16 |
| 93 | 10 | 41 | 64.27 | 6.68 | 29.05 | ..... | 75.90 | 19.74 | 4.35 | 86.60 | 7.62 | 5.78 | 27.42 | 41.21 | 17 |
| 2 08 | 96 | 1 27 | 54.54 | 19.40 | 25.97 | ..... | 100.00 | ..... | ..... | 50.00 | 25.00 | 25.00 | 137.50 | 50.00 | 18 |
| 1 10 | 22 | 95 | 48.47 | 9.83 | 41.70 | 6 | 43.88 | 46.65 | 9.48 | 82.72 | 11.39 | 5.89 | 21.24 | 12.08 | 19 |
| 1 06 | 08 | 33 | 72.22 | 5.72 | 22.06 | ..... | 62.03 | 34.96 | 3.01 | 76.62 | 14.33 | 9.05 | 80.52 | 42.90 | 20 |
| 41 | 05 | 1 30 | 23.29 | 3.08 | 73.63 | 13 | 53.23 | 45.16 | 1.60 | 86.02 | 5.37 | 8.60 | 39.25 | 90.88 | 21 |

*a* Loss.

## REMARKS ON TABLE 16.

Table 16 contains the principal results thus far compiled from the schedules of the production of iron ore during the census year ending June 1, 1880. The ton of 2,000 pounds is invariably used.

The second column of Table 16 gives the number of mines or establishments which have a regular industrial organization, and from whom it was possible to obtain an account of the capital, wages, and materials employed.

The sixth column, headed "irregular product", gives the amount of iron ore raised between the above dates by persons the principal part of whose livelihood was obtained in some other occupation, generally farming. In b twelve of the states there are localities where soft ore can be obtained from surface diggings. These are worked by farmers during the intervals of agricultural employment, the product drawn by farm teams to the nearest furnace and sold. The quantities of ore so produced by individuals vary from 5 to 500 tons. In some instances, again, furnace companies own the land on which the ore is dug, and hire the farmers of the neighborhood to deliver it at the furnace for a fixed price per ton. This work is done in such an irregular and desultory manner that the only items safely attainable are the amount and value of the product, although the total so produced amounts to over a ninth (11.4 per cent.) of the entire tonnage of the country. An account of purchases of ore was obtained from the furnace companies in these localities, with the name of the producer, the price and technical name of the ore, and the name of the county where the ore was mined, or, more properly, dug. Great care has been taken to avoid duplication of any of the amounts so produced, by comparing the names taken from the books of the smelting establishments c with the names on the regular schedules of production received from our agents.

It will therefore be observed that no items based on this "irregular product" appear in the columns of employés, wages, materials, capital, etc.

The columns of production, both "regular" and "irregular", contain no estimates, but are made up from authentic returns.

A small amount of ore raised in Colorado is omitted, as it is used as a flux, and does not, as yet, affect the iron-manufacturing industry.

The total production, 7,974,806 tons, exceeds the amount reported as consumed in manufacturing establishments by Mr. Swank (7,709,706 tons) by 265,100 tons. There was imported during the census year at the ports of Buffalo, Boston, Oswego, Philadelphia, New York, and Baltimore 439,451 tons, from which it would appear that the stocks d of ore on hand must have increased during the census year about 704,551 tons, or that only 91.62 per cent. of the ore produced (and imported) was consumed during the period. In view of the fact that there was a scarcity of iron ore in 1879, and that many new mines were opened in consequence, whose stocks failed to reach consumers before the summer of 1880, the two results are easily reconcilable.

The value of the ore is taken at the mine, or at the point of the delivery to a customer or a transportation company, but always at the point where the expenses of labor and material, which come under our consideration, cease. Where the ore is smelted by the same company which mines it, it not unfrequently happens that the cost and value as returned are the same, since the ore is regarded as part of the furnace supplies. This has had the effect of depressing slightly the value returned to us below the market price, and of carrying part of the profits of mining into the manufacture of pig-iron.

e In nearly all of the iron-mining districts of the country, though the systems of labor vary, it is the custom that each miner or underground laborer furnish his oil or candle, and when working by the ton, his own powder and fuse. The amounts thus expended have, as far as possible, been deducted from the pay of the men and added to the cost of material, in order that the column headed "wages" might more nearly represent the net cash income of the laborer available for his support.

"Labor" is classified with regard to age and occupation. In the underground mines the classes of employés are well defined. In the open-cut and quarry mines the distinction between laborers and miners is more indefinite.

"Materials used" covers everything consumed in the business, including, among the more important items, feed for animals, timber, fuel, repairs of all kinds, tools, powder, fuse, lights, etc.

"Capital" is divided into—

f First, "working capital," or the sum of money required to run the mine from month to month and to pay wages and buy materials in producing the stock that is ordinarily carried. Taking the broad view of the entire industry, this portion of the capital is represented by marketable product and is not jeopardized.

Second, "plant," which represents the permanent openings, roads, buildings, machinery, etc., which are subject to rapid deterioration, require constant repairs, and are of little value when the mine is exhausted.

Third, "real estate," which means the land as a mineral producer, its value as such being considered apart from its possible value for agricultural or forestry purposes. This value is a fund which is constantly diminished as the ore is withdrawn, and eventually reaches zero; and must be made good by capitalizing the royalties. The lands in question are not wild lands, but such as are attached to a working mine. Their acreage cannot be given, as iron-ore deposits are irregular in their occurrence, but their extent is such that for all practical purposes their present annual yield may be regarded as not likely to be diminished for many years.

## REMARKS ON TABLE 17. a

Table 17 contains the averages drawn from the data in Table 16.

In finding the average net income of a man, the three classes of labor are considered together, and two boys are considered the equivalent of one man in earning capacity.

The year, which is divided in percentages of time lost and made, is the working year of twelve months of 25 working days each.

The small amount of time lost in strikes, equivalent to the average working lifetime of two men only, shows that no serious conflict between capital and labor arose during the census year in this industry. b

The low rate of monthly wages must be qualified by the consideration that the miner receives the advantages of low rent and prices of the necessaries of life, and in some cases privileges which cannot be brought into columns of statistics, but which tend to equalize his condition with the higher-paid labor of cities.

As stated before, the price of ore in some of the states, notably Georgia, North Carolina, Tennessee, Ohio, Virginia, and West Virginia, is seriously lowered by the fact that it is returned by furnace companies who, in many cases, include, in the price given, no allowance for royalty nor profit, as they charge it to their furnaces at cost. We have not felt at liberty to change the price fixed by a producer without positive information.

The product would replace the capital employed and invested in little more than three years, but the profits and royalty would require nearly seven and three-quarter years to effect the same result. It requires an investment of $8 75 on the average to produce a ton of ore yearly. c

The annual product, as will be observed, is but little in excess of one-half of the maximum capacity. The mines which yield ore fit for the manufacture of Bessemer steel, however, approach much nearer their greatest possible yield. "Maximum capacity" means an estimate of what could be produced from present developments, with present appliances, under the stimulus of a pressing demand. It could be attained with an increase of working capital and labor only. Its excess over real product is partly accounted for by the fact that many new mines went into operation during the latter part of the year.

The following table presents some comparisons with the census of 1870:

TABLE 18.

*Changes in the iron-ore mining industry in the United States during the decade ending June* 1, 1880, *expressed in* d *percentages on the returns of the census of* 1870.

| | Per cent. | |
|---|---|---|
| Gain in number of establishments | 91.67 | |
| Gain in total number of employés | 110.81 | |
| Gain in total horse-power of steam-engines | 189.69 | |
| Gain in amount paid as wages | 39.48 | |
| Gain in amount paid for material | 126.33 | |
| Gain in total capital | 247.61 | |
| Loss in value per ton of product | 25.45 | |
| Gain in value of total product | 75.45 | |
| Gain in tonnage of total product | 135.00 | |
| Gain in product of regular establishments | 108.00 | |
| Loss in yearly income of man | 32.13 | e |
| Loss in per cent. of value of product paid for labor | 5.19 | |
| Gain in per cent. of value of product paid for materials | 4.46 | |
| Gain in per cent. of value of product retained for royalty, interest, profits, etc | 0.74 | |

The gain in the total number of mine employés, 110.81 per cent., is slightly more than the gain, 108 per cent., in the product of the establishments to which they belong. This arises from the fact that many new mines were opened in 1879–'80, which were not productive till the latter part of the year. The effectiveness per man has undoubtedly been increased by the increased use of power, as shown in the large per cent., 189.68, and by the introduction of improved drilling machinery and high explosives. The census of 1870, unfortunately, affords no basis for making this important comparison. f

Proportionately more is expended for material and less for labor than was the case in 1870. This arises partly from the fact that wages are reduced to net wages, as explained before, and partly from a real increase in consumption of supplies as mining becomes more systematic and dependent on mechanical appliances.

The average yearly incomes of labor cannot be justly compared, for the same reason that we cannot compare its effectiveness, *i. e.*, because we cannot ascertain the proportion of the year lost in 1870.

The number of boys employed has increased at a much more rapid rate than the number of men. They now constitute 5 per cent. of the entire force, and have increased 348 per cent. in ten years.

The large gain in capital, 247.61 per cent., is explained by the fact that all iron-ore producing property was included in the present census, whether it belonged to the mine operator or was leased or worked on a royalty. Viewing the iron lands returned as a whole, they are capable of keeping up the present annual yield for na

a indefinite time, though parts of them may become rapidly exhausted. Extending the average royalty of 42 cents a ton to the entire product, we would have a yearly income of over three millions of dollars, or rather more than 6.25 per cent. on the returned value of the real estate. In view of the fact that this income, though not likely to be diminished for fifty years to come, is very far from being a perpetual annuity, it will be seen that the present value of the real estate is not overestimated.

After taking out the royalty charge, if from the remainder of the annual net receipts we deduct an amount equal to 6 per cent. interest on the working capital, there is left, in round numbers, the sum of $4,690,000. The "plant", consisting of animals, boilers, engines, tools, buildings, cars, tracks, etc., is subject to a deterioration of not far from 30 per cent. yearly. Deducting this, leaves $2,096,000 as the profits and expenses of the general b management of the business, or a trifle over 9 per cent. of the value of the annual product, a proportion which cannot be called excessive; for it must be remembered that, though the income of the business, *as a whole*, is a steady and regular addition to our national wealth, each individual mine is subject to interruptions from accidents, and to exhaustion of the mineral deposit. Consequently, the net income of each individual mine cannot be regarded as consisting solely of interest, royalty, and profits, but must be charged, for safety, with a certain sum for insurance against unforeseen contingencies, which would not be necessary if one company owned the entire property.

The conditions of iron-ore mining are so different in different districts that only the most general analysis can be applied to the totals. The above considerations show that the general relations between capital and production spread over our returns are harmonious, and are given, not so much with a view to prove the healthy condition of the industry, as to justify the assertion that our valuations of capital are very far from extravagant, though the c period during which they were made—the summer of 1880—was one of great activity in iron mining.

It may be observed, too, that the real estate which furnishes the "irregular product" of 909,977 tons is far from worthless as mineral land, though we have not included it in our valuation. Its principal value, however, consists in the fact that it affords its owners a field for moderately remunerative labor.

The average price per ton has fallen from $3 89 to $2 90, or 25.45 per cent. As gold averaged about 30 per cent. above the the paper dollar in 1870, the true fall in iron ore is only 14 cents a ton.

Since the last census was taken the average price per ton has changed in the five great states as follows: In Michigan it has fallen 15 per cent.; in Missouri it has risen 56.32 per cent.; in New Jersey it has fallen 30 per cent.; in New York it has fallen 29 per cent.; in Pennsylvania it has fallen 35 per cent. These irregularities are chiefly due to the increased demand for ores suitable to the manufacture of Bessemer steel.

d

TABLE 19.—*List of iron-ore producing states in order of the production of* 1880.

| | States. | Total product. | Per cent. of total product. | Per cent. of total value of product. | | States. | Total product. | Per cent. of total product. | Per cent. of total value of product. |
|---|---|---|---|---|---|---|---|---|---|
| | | *Tons.* | | | | | *Tons.* | | |
| 1 | Pennsylvania | 2,185,675 | 27.407 | 23.817 | 13 | Massachusetts | 62,637 | 0.785 | 0.977 |
| 2 | Michigan | 1,837,712 | 23.044 | 26.051 | 14 | West Virginia | 61,216 | 0.767 | 0.394 |
| 3 | New York | 1,262,127 | 15.827 | 15.776 | 15 | Wisconsin | 41,440 | 0.519 | 0.316 |
| 4 | New Jersey | 737,372 | 9.497 | 12.594 | 16 | Connecticut | 35,018 | 0.439 | 0.638 |
| 5 | Ohio | 547,403 | 6.864 | 5.480 | 17 | Oregon | 6,972 | 0.087 | 0.020 |
| e | | | | | | | | | |
| 6 | Missouri | 386,197 | 4.843 | 7.230 | 18 | Maine | 6,000 | 0.075 | 0.039 |
| 7 | Alabama | 191,676 | 2.404 | 0.872 | 19 | Texas | 3,600 | 0.046 | 0.035 |
| 8 | Virginia | 182,326 | 2.286 | 1.899 | 20 | North Carolina | 3,318 | 0.041 | 0.023 |
| 9 | Maryland | 139,628 | 1.751 | 1.820 | 21 | Delaware | 2,726 | 0.034 | 0.028 |
| 10 | Tennessee | 104,465 | 1.310 | 0.638 | 22 | Vermont | 560 | 0.007 | 0.012 |
| 11 | Georgia | 91,416 | 1.147 | 0.621 | 23 | Indiana | 513 | 0.007 | 0.004 |
| 12 | Kentucky | 64,809 | 0.813 | 0.716 | | The United States | 7,971,706 | | |

TABLE 20.

f The rank of the 16 states reported in the census of 1870, as producers of iron ore, was as follows:

| | | | |
|---|---|---|---|
| 1. Pennsylvania. | 5. Ohio. | 9. Massachusetts. | 13. Vermont. |
| 2. Michigan. | 6. Missouri. | 10. Wisconsin. | 14. North Carolina. |
| 3. New York. | 7. Maryland. | 11. Kentucky. | 15. Delaware. |
| 4. New Jersey. | 8. Tennessee. | 12. Virginia. | 16. Indiana. |

The 6 great iron states retain in 1880 their former relative rank, and Alabama, a new state, takes the rank next them. Pennsylvania and Michigan yield over one-half the entire product. The 6 states at the head of the list yield 87.48 per cent. of the total, which is worth 90.94 per cent. of the total value. Sixteen states were reported in 1870 against 23 at present. The new iron-producing states are Alabama, Georgia, West Virginia, Connecticut, Oregon, Maine, and Texas. They produce 4.96 per cent. of the product. Virginia has gained four places; Maryland and Tennessee have lost two, Massachusetts four, and Kentucky one.

TABLE 21.—*List of counties of the first class producing over* 100,000 *tons.*

| | County. | State. | Tons. | | County. | State. | Tons. |
|---|---|---|---|---|---|---|---|
| 1 | Marquette | Michigan | 1,346,365 | 8 | Blair | Pennsylvania | 154,014 |
| 2 | Essex | New York | 631,807 | 9 | Saint François | Missouri | 144,265 |
| 3 | Morris | New Jersey | 568,420 | 10 | Lawrence | Ohio | 136,464 |
| 4 | Menominee | Michigan | 491,347 | 11 | Dutchess | New York | 126,654 |
| 5 | Lehigh | Pennsylvania | 419,700 | 12 | Northampton | Pennsylvania | 122,526 |
| 6 | Berks | do | 304,954 | | Total of 12 counties of the 1st class. | | 4,869,510 |
| 7 | Lebanon | do | 285,620 | | | | |

The 12 counties above produced 61.06 per cent. of the entire tonnage, of which total Marquette county, Michigan, must be credited with 16.88 per cent.

Menominee county, Michigan, is the only one of the above which did not produce iron ore in 1870. The total number of counties from which reports have been received and tabulated is 135, against 71 in 1870, a gain of a little over 90 per cent.

TABLE 22.—*List of counties of the second class producing less than* 100,000 *tons and over* 50,000 *tons.*

| | County. | State. | Tons. | | County. | State. | Tons. |
|---|---|---|---|---|---|---|---|
| 13 | Clinton | New York | 92,166 | 21 | York | Pennsylvania | 70,058 |
| 14 | Orange | do | 90,742 | 22 | Jefferson | New York | 64,111 |
| 15 | Crawford | Missouri | 87,033 | 23 | Berkshire | Massachusetts | 62,037 |
| 16 | Putnam | New York | 94,117 | 24 | Dent | Missouri | 58,878 |
| 17 | Sussex | New Jersey | 80,605 | 25 | Iron | do | 57,207 |
| 18 | Lancaster | Pennsylvania | 78,850 | 26 | Warren | New Jersey | 50,214 |
| 19 | Fayette | do | 76,140 | | Total of the 14 counties of the 2d class. | | 1,056,823 |
| 20 | Cumberland | do | 75,015 | | | | |

The above 14 counties, in 5 states, produce 13.25 per cent. of the entire product. The 26 leading counties produce 74.31 per cent. of the entire product, leaving 25.69 per cent. to be spread over the remaining 109 counties.

The following table contains a list of all mines or industrial establishments producing over 50,000 tons during the census year, in the order of their production:

TABLE 23.

| State. | County. | Name of mine. | Product. | Value of product. | Employés. |
|---|---|---|---|---|---|
| | | | *Tons.* | | |
| Pennsylvania | Lebanon | Cornwall Ore Bank | 260,000 | $500,000 | 135 |
| Michigan | Marquette | Republic | 224,000 | 800,000 | 600 |
| Do | do | Lake Superior Iron Company | 215,930 | 771,180 | 542 |
| Do | Menominee | Norway & Cyclops | 210,875 | 527,187 | 510 |
| New York | Essex | Old Bed | 208,416 | 744,344 | 321 |
| Do | do | Mine 21 | 187,448 | 238,525 | 282 |
| Missouri | Saint François | Iron Mountain | 144,153 | 1,001,801 | 300 |
| Michigan | Marquette | Jackson | 134,585 | 569,582 | 252 |
| Do | do | Cleveland Iron Mining Company | 125,440 | 448,000 | 450 |
| New York | Essex | Crown Point | 112,000 | 500,000 | 450 |
| Michigan | Marquette | Champion | 99,609 | 355,748 | 350 |
| New Jersey | Morris | Glendon Hibernia | 85,623 | 382,245 | 550 |
| Michigan | Menominee | Vulcan | 83,394 | 208,485 | 200 |
| Do | Marquette | Michigamme | 66,158 | 212,052 | 197 |
| Do | Menominee | Quinnesec | 63,089 | 159,220 | 178 |
| Missouri | Crawford | Merimee Iron Mining Company | 60,385 | 134,788 | 184 |
| New York | Putnam | Tilly Foster Iron Mines | 56,000 | 131,500 | 250 |
| Missouri | Iron | Pilot Knob | 52,761 | 115,093 | 410 |
| New Jersey | Morris | Mount Hope | 50,379 | 264,390 | 194 |
| Total | | | 2,460,845 | 8,222,040 | 6,355 |

The preceding 19 mines yielded 34.85 per cent. of the entire tonnage of the "regular mines", the value of which reached 40.16 per cent. of the value of the total. The labor employed by them, however, aggregates only 20.06 per cent. of the entire force, as it is generally worked more continuously and at higher wages.

The product of the Cornwall Ore Bank was 3.97 per cent. and of the Republic 3.17 per cent. of the entire product of the regular mines.

One hundred and seventy-four mines have been opened during the census year, or 21.6 per cent. of the total reported.

During the census year the iron-mining industry consumed 6,907,931 linear feet of round timber for props, etc., valued at $114,951; 8,625,463 superficial feet of sawed lumber, valued at $128,110; and 88,443 cords of wood for fuel, valued at $177,309; all of which is included in the gross amount of materials used.